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# AGRICULTURAL MARKETING IN INDIA

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## Report on the MARKETING OF POTATOES IN INDIA AND BURMA

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## INTRODUCTION.

The potato is probably the most widely grown of all the vegetables in India and the acreage has shown a steady increase during the last decade. Unless suitable steps are taken, however, the position of producers is likely to be adversely affected by War conditions owing to the dependence of certain areas on imported supplies of Italian seed. In the War of 1914-18, seed potatoes from Italy were not available with the result that the area under potatoes, especially in the Bombay Presidency, Sind, Mysore, Palampur and Baroda could not be maintained. For instance, in Poona district alone, the area came down from 6,026 acres in 1914-15 to 2,345 acres in 1918-19 at the end of the War.

Potatoes being a perishable commodity, high losses occur in storage and during the process of marketing. About 8,553,000 maunds of potatoes valued at over one and a half crore rupees are estimated to be lost in this way due to unsuitable storing and transport facilities. This discourages the farmers from preserving seed from their own crop and adds considerably to the cost of production. The solution, apparently lies in improving existing methods of storage and in opening more cold storage depots as has already been done at a few centres with commercial success.

There is great confusion regarding the names of varieties of potatoes produced in different parts of the country. Suggestions have, therefore, been made in this report for the rough classification of the existing varieties and the elimination of unsuitable ones. Measures have also been suggested for ensuring the supply of reliable seed true to type.

The report also sets out how returns to producers can be increased by reducing the cost of distribution. At present, the grower gets only about 50 per cent of the price paid by the consumer. The establishment of reliable sales agencies, the extension of market news service and arrangements for the better storage and transport of the produce would enable the producer to get higher returns.

Apart from these more general considerations, the report deals with many points of detail concerning the grading and packing, finance, research, assembling, distribution and transport of potatoes, the storing of surplus produce, organisation of seed supplies and the formation of growers' co-operative societies. Any of these points, if attended to, would improve the marketing of potatoes in India and help to alleviate in some measure the present condition of the growers.



Thanks and acknowledgments are due to a large number of producers, potato merchants, scientific workers and others for their kind and friendly co-operation with the marketing staff, in providing material for this report.

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NOTE.—The Government of India should not be regarded as assuming any responsibility for all or any of the material contained in this report.

**TO THE GENERAL READER.**

**FOR A QUICK GRASP OF THIS REPORT READ THE  
INTER-CHAPTERS AT PAGES 35, 52, 77, 92, 106, 131,  
157, 181, 200, 227, 240, 247 and 255.**

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*January 1941.*

## CHAPTER I.—SUPPLY.

### A.—India's position in the world production and trade.

#### (1) EXTENT OF TRADE.

The potato forms an important part of the people's diet in all countries having a temperate climate. Of all the food crops, potatoes are most abundantly produced in the world as a whole as will be seen from the following table which gives the world production of potatoes, and of wheat and rice which are the other main food crops:—

*Average annual world production of some of the important food crops  
(1933-37)*

Crop.	*World's production. (In million maunds).
Potatoes . . . . .	6,010
Wheat . . . . .	3,534
Rice . . . . .	2,411

It will be seen that the production of potatoes is almost twice as much as that of wheat and three times as much as that of rice. In making this comparison, however, it may be noted that potatoes contain a higher proportion of water as compared with the other two crops. The food value of potatoes, for example, is only 36 calories per oz. as compared with 102 for wheat and 114 per oz. of parboiled rice.

#### (2) ACREAGE AND PRODUCTION.

The area and production of potatoes in different countries of the world for the period 1933-38, are given in Appendix I. The position in some of the main producing countries of the world including India is shown in the following table (see diagram facing page 2):—

*Average annual area and production of potatoes in important producing countries  
of the world.*

(1933-37)

Name of country.	Area. (In thousand acres).	Percentage of total world area.	Production. (In million maunds).	Percentage of total production.
Germany . . . . .	7,062	13.9	1,256	20.9
France . . . . .	3,494	6.9	412	6.9
Italy . . . . .	1,015	2.0	70	1.2

\* International Year Book of Agricultural Statistics, 1938-39.

*Average annual area and production of potatoes in important producing countries of the world—contd.*

(1933-37)

Namo of country.	Area. (In thousand acres).	Porcentage of total world area.	Production. (In million maunds).	Percentage of total production.
Poland . . . . .	7,021	13.9	905	15.0
United Kingdom . . . . .	748	1.5	137	2.3
Czechoslovakia . . . . .	1,859	3.7	260	4.3
Union of Soviet Socialist Republics . . . . .	16,876	33.3	1,604	26.7
United States of America . . . . .	3,357	6.6	271	4.5
Rumania . . . . .	741	1.5	53	0.9
India . . . . .	449	0.9	49	0.8
Other countries . . . . .	7,999	15.8	993	16.5
Total . . . . .	50,621	100.0	6,010	100.0

It is seen that nearly two-thirds of the world's area under potatoes is concentrated in the neighbouring Baltic countries of Germany, Poland and Union of Soviet Socialist Republics. The share of India both in world acreage and production is very small being less than one per cent in each case.

### (3) INTERNATIONAL TRADE.

Of the total production of the world, about 0.6 per cent enters the international trade. Appendix II shows the exports and imports of potatoes from and into the principal countries of the world. (See diagram facing page 3). From this it will be seen that the international trade in potatoes is mainly confined to the United Kingdom, Italy, France, Netherlands, Germany, Belgo-Luxemburg, Argentina and Canada.

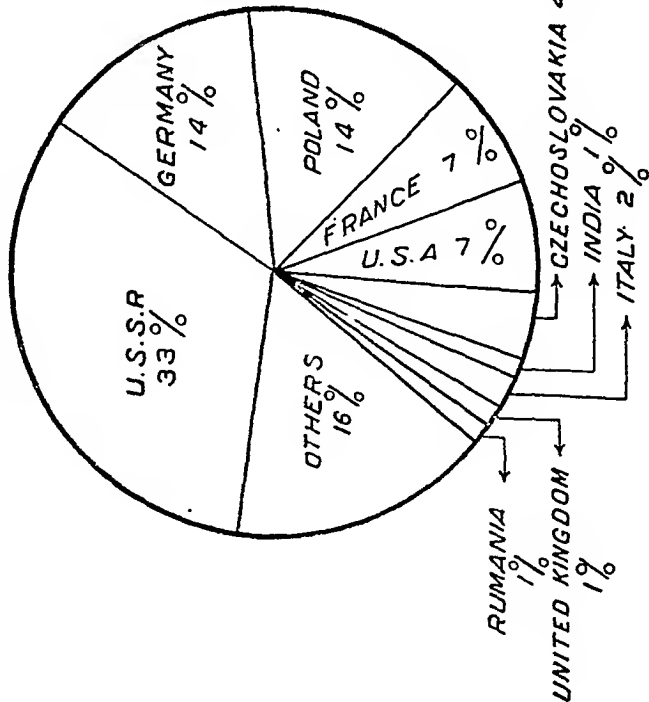
The chief exporting countries of the world are Netherlands, Italy, France, Canada and Belgo-Luxemburg. Netherlands alone accounts for nearly one-fourth of the world's total export trade, while Italy and France together contribute about 14 per cent. Although Russia and Germany are the two biggest producing countries in the world, yet their share in the export trade is very small.

The chief importing countries are United Kingdom, France, Germany, Belgo-Luxemburg, Italy and Argentina. India is mainly an importing country and her imports form 3.7 per cent of the total import trade of the world. The annual imports into India based on the figures for 1935-36 to 1938-39 amount to 1,155,738 maunds valued at Rs. 33,18,706. The largest imports of potatoes into India during this period were in the year 1937-38, when 1,336,242 maunds of potatoes valued at Rs. 38,44,099 were imported.

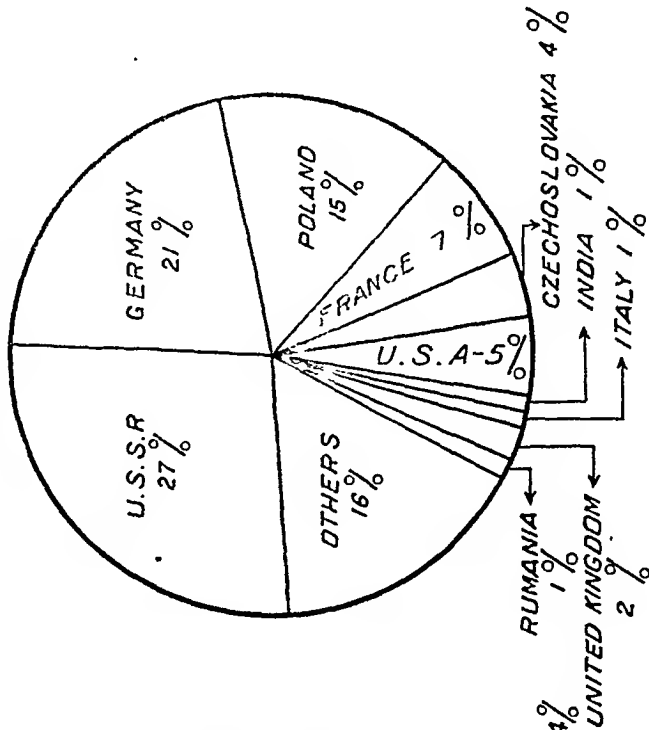
# SHARE OF DIFFERENT COUNTRIES IN ACREAGE & PRODUCTION OF POTATOES IN THE WORLD.

(AVERAGE 1933-37)

## ACREAGE

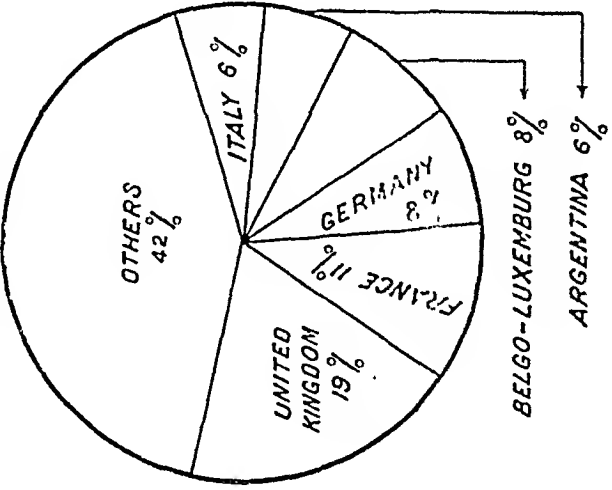


## PRODUCTION

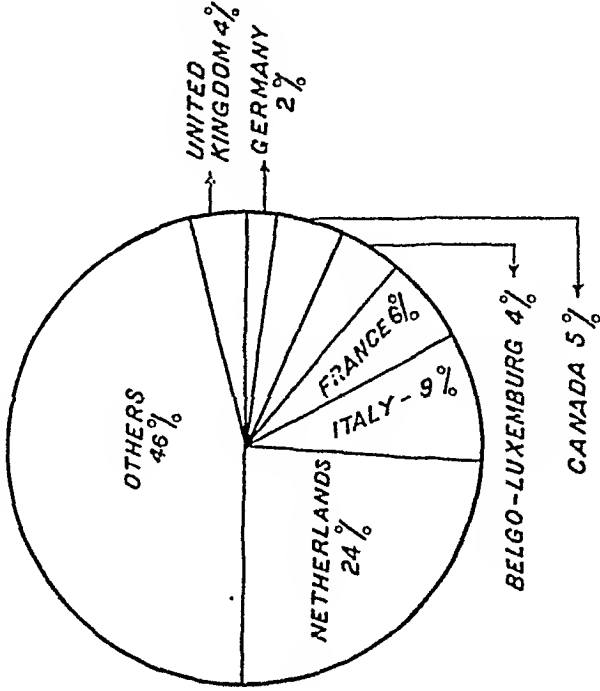


SHARE OF DIFFERENT COUNTRIES IN THE IMPORT & EXPORT TRADE  
OF POTATOES IN THE WORLD.  
(AVERAGE 1933-37)

IMPORTS



EXPORTS



## B.—Indian supplies.

### (1) GENERAL.

The potato (*Solanum tuberosum*) is called by various Indian names such as *alu*, *bilaiti alu*, *batata*, *urulai*, *kilangu* and *urula gudda* and is cultivated more or less in all parts of India. A century ago it was comparatively unknown in India, but to-day it is probably the most extensively used of all vegetables. This is due in part to its mild flavour which lends itself readily to combination with other foods. The pioneer work in the introduction of this crop was done by the English people. According to Dr. Ainslie\* as reported by Duthie, "the potato came to India originally from the Cape of Good Hope. Its cultivation on the hills north of Dehra Dun was first started by Major Young when Mussoorie was indicated on maps under the name of the 'potato garden'. The quality was afterwards improved by Capt. Townsend, and by about the year 1839 potato cultivation became general in the plains and on the hills". In the beginning, when the potato was introduced, the orthodox Brahmins objected to its use because it is not mentioned in the *Hindu Puranas* as an article of food. But the prejudice against it vanished gradually and now it is used by all classes. In fact, on fast days the Hindus in some parts now consume it in large quantities as it is one of the root crops included in the list of articles which can be eaten during a fast.

The main areas of concentrated production lie in the North. United Provinces, Bihar, Bengal and Assam, for example, account for more than 80 per cent of the acreage. In Bombay, the main area of production is in the neighbourhood of Poona. Elsewhere in the South, the production of potatoes is mainly confined to the Nilgiri Hills and to a smaller extent to the plateau of Mysore, mostly around Bangalore. (See map facing page 6).

### (2) ACREAGE.

Statistics regarding acreage under potatoes are not generally maintained separately. In official publications, all kinds of vegetables and fruits are grouped together under a common head "Fruits and vegetables including root crops". It may be observed that such records have very little practical value. In a few places the local revenue officers maintain separate figures of acreage under potato and in respect of such areas the actual figures have been obtained; but where no records are kept, the figures of area and production have been arrived at after consulting the revenue staff, experienced growers and officials of the agricultural and other departments. In view of the commercial importance of the potato crop, it seems desirable that provinces and States should maintain records of area and production so that the exact position of home supplies may be ascertained. Such returns, however, need only be called for from those districts where potatoes are known to be grown for sale.

(a) *Total acreage.*—The total area under potatoes in India based on the average of 1934-35 to 1938-39 figures is estimated at 448,700 acres, which represents 0.2 per cent of the average net sown area. Nearly 95 per cent of the area is estimated to be in British India and the remaining 5 per cent

\*Duthie, J. F : "Field and Garden Crops of the North-Western Province and Oudh."

in the Indian States. Of the total area under this crop in 1938-39, about 422,100 acres are estimated to be in the plains (including the Deccan) and the remaining 46,600 acres in the hills. Generally, two crops—one in winter and the other in summer—are raised in the plains and sub-montane tracts. The winter crop is by far the more important and represents 95 per cent of the total potato area in the plains. In the hills situated in the north of the country only a summer crop is usually raised on account of the severity of the winter. In the Nilgiri Hills in the South, however, where the winter is mild, two or three crops are raised in the same year. On the whole, about 87 per cent of the total area under potatoes in the hills is planted in summer and the remaining 13 per cent in winter. (See also diagram facing this page). The area in the Nilgiri Hills accounts for nearly three-fourths of the latter.

The planting of the winter crop in the plains usually begins in September and continues till about the middle of December. In the case of the summer crop, the planting usually begins by about February; and in some cases where a rain crop is taken, with the out-break of the monsoon. In the hills, the planting of the summer crop is usually done during February, March and April, and that of the winter crop in August and September. The seasons of planting and harvesting of potatoes in the important potato producing provinces and States are given in Appendix III. (See also diagram facing page 5).

**Burma.**—The potato cultivation in Burma is a recent development. It is believed that potatoes were first introduced into the Shan States from China. This belief is supported by the fact that one of the oldest varieties of potatoes grown in Shan States at the time of the introduction of the British influence was and is still called *Tayok*, i.e., Chinese potatoes.

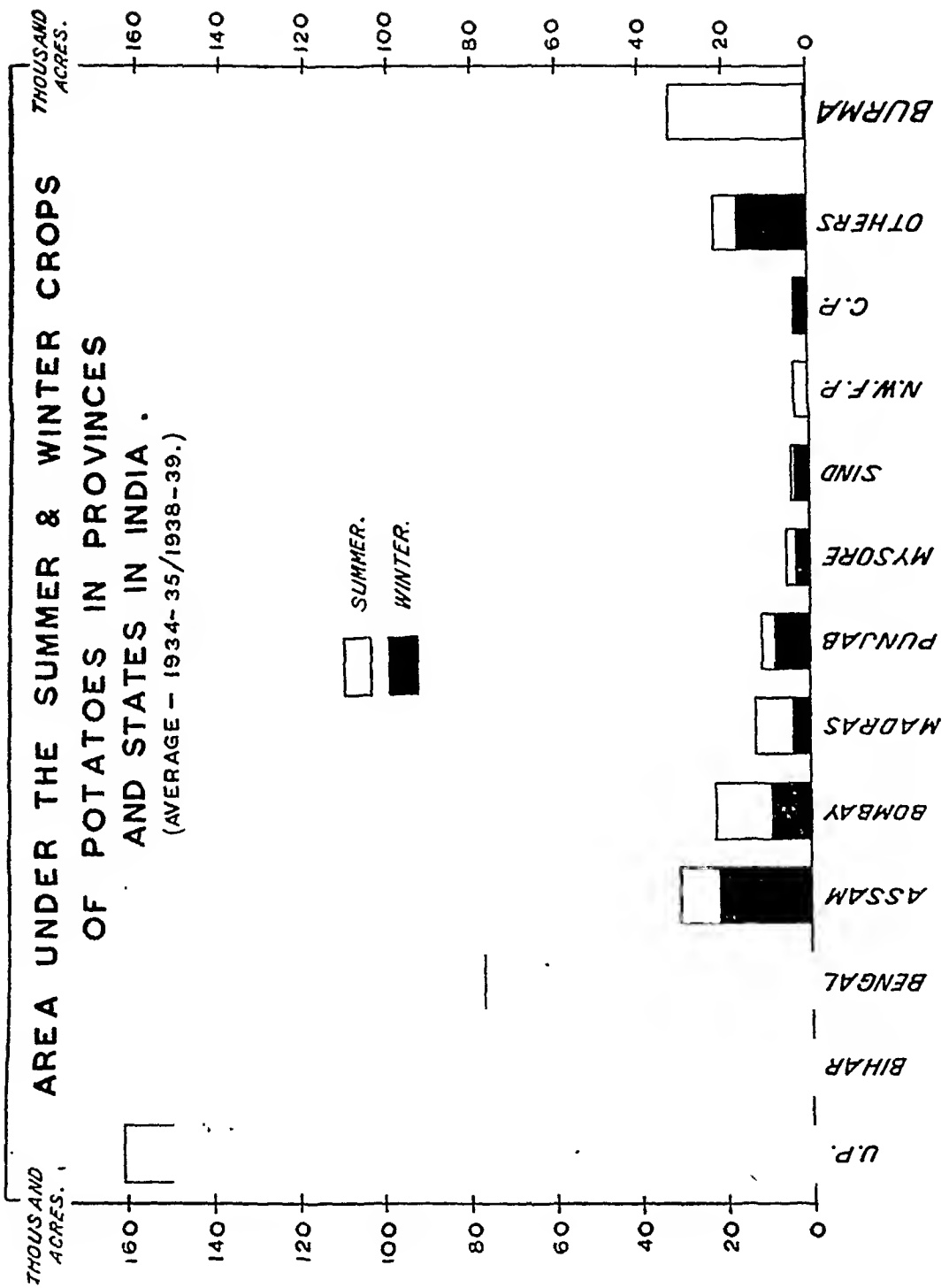
The main areas of potato cultivation in Burma including Shan States are the Myelat areas around Aungban and Heho in Southern Shan States, and the Mandalay-Kyun, Bhamo and Myitkyina tracts in Burma proper. (See map facing page 6). The Shan States area is by far the most important, accounting for 87 per cent of the total production. Mandalay, Myitkyina and Bhamo come next in order of importance and together account for the remaining 13 per cent of the production. The area under potatoes in Burma based on the average estimated figures of five years, 1934-35 to 1938-39, is about 29,700 acres.\*

The potato crop in Burma is grown under three distinct sets of conditions. It comprises (i) the "summer crop" grown with the help of irrigation, (ii) the "rain crop" grown on the upland areas and (iii) the "winter crop" grown on the alluvial lands, subject to annual inundation. On the basis of average production, the area under the "summer crop" is estimated at 9.8 per cent, the "rain crop" at 81.8 per cent and under "winter crop" at 8.4 per cent of the total area under potatoes. The area under "rain crop" is entirely in the Shan States, seven-eighths of which is in the Southern Shan States and one-eighth in the Northern.

(b) *Distribution of area.*—It will be observed from the map facing page 6 that the potato acreage is not uniformly distributed, but is concentrated in certain tracts. The area under potatoes in the important provinces and States on a 9 year average is given in Appendix V. The share of each of the more important provinces and States based on the average estimated

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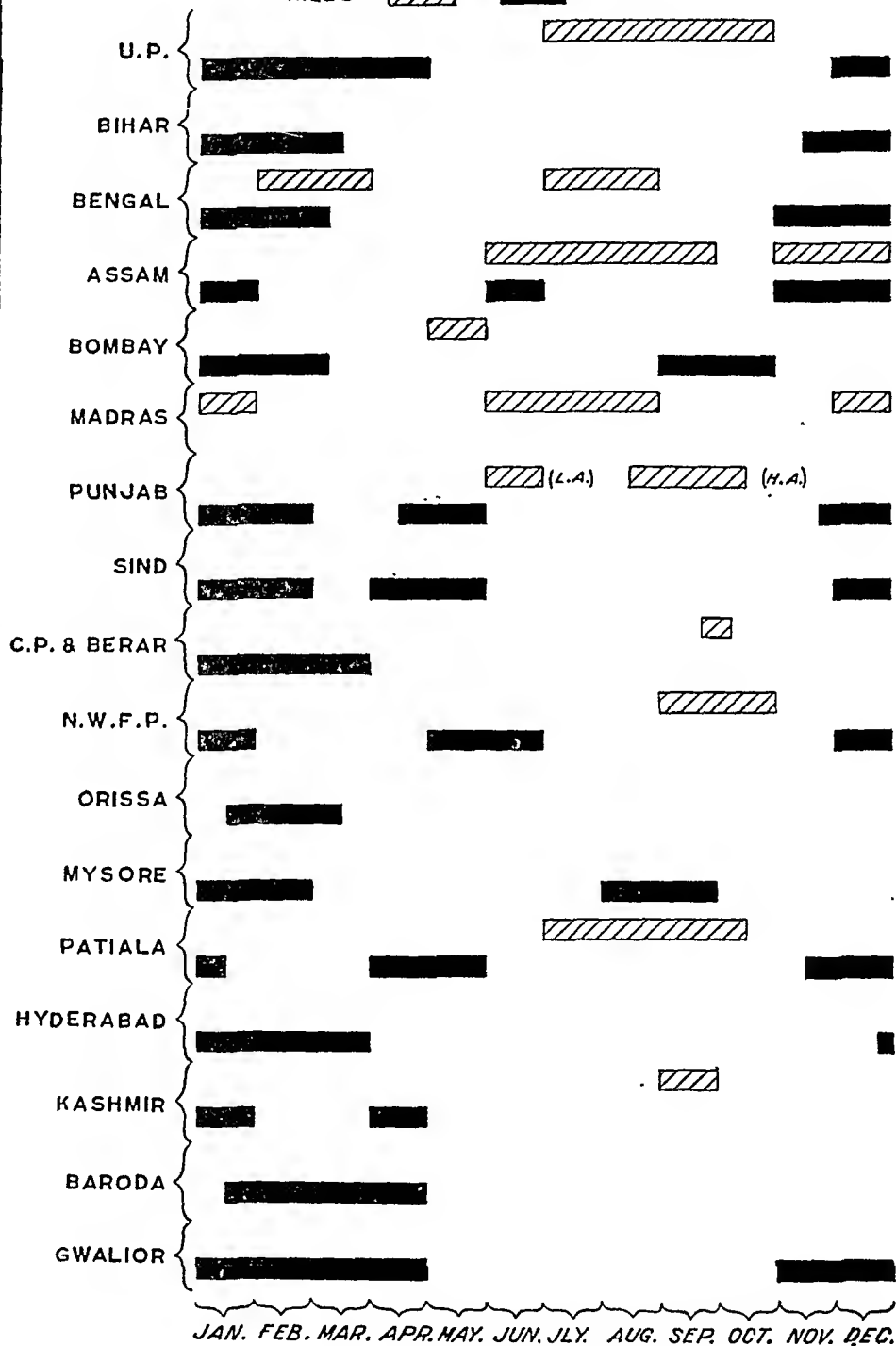
\* The area has been estimated on the basis of production figures.





# SEASONS OF HARVESTING OF POTATOES IN THE HILLS & PLAINS IN PROVINCES & STATES OF INDIA .

REFERENCES

HILLS →  ← PLAINS.

JAN. FEB. MAR. APR. MAY. JUN. JULY. AUG. SEP. OCT. NOV. DEC.

L.A. = LOW ALTITUDE .

H.A. = HIGH " .

figures for the period 1934-35 to 1938-39 is shown in the following table (see also diagram facing page 7) :—

*Area under potatoes in provinces and States in India during 1934-35 to 1938-39.*  
(In acres).

Provinces and States.	In plains (including Deccan).		In hills.		Total.	
	Area.	Percentage.	Area.	Percentage.	Area.	Percentage.
United Provinces . . .	150,000	37.1	11,800	26.2	161,800	36.1
Bihar . . . . .	90,000	22.3	..	..	90,000	20.0
Bengal . . . . .	76,200	18.9	1,200	2.7	77,400	17.2
Assam . . . . .	21,800	5.4	9,700	21.6	31,500	7.0
Bombay . . . . .	22,400	5.6	100	0.2	22,500	5.0
Madras . . . . .	..	..	14,200	31.5	14,200	3.2
Punjab . . . . .	10,800	2.7	800	1.8	11,600	2.6
Sind . . . . .	4,200	1.0	..	..	4,200	0.9
Central Provinces . . .	3,100	0.8	300	0.7	3,400	0.8
North-West Frontier Province.	600	0.2	3,200	7.1	3,800	0.8
Mysore State . . . .	5,700	1.4	..	..	5,700	1.3
Patiala . . . . .	400	0.1	1,500	3.3	1,900	0.4
Gwalior . . . . .	1,400	0.3	..	..	1,400	0.3
Baroda . . . . .	800	0.2	..	..	800	0.2
Orissa . . . . .	2,600	0.6	..	..	2,600	0.6
Hyderabad . . . . .	400	0.1	..	..	400	0.1
Other States and provinces.	13,300	3.3	2,200	4.9	15,500	3.5
Total . . . . .	403,700	100.0	45,000	100.0	448,700	100.0

From the table on preceding page it is clear that the largest area under potato cultivation in India lies in the United Provinces and constitutes 36.1 per cent of the total area. Next in order of importance are Bihar, Bengal, Assam, Bombay, Madras and the Punjab with 90,000, 77,400, 31,500, 22,500, 14,200 and 11,600 acres respectively. British India accounts for about 95 per cent of the total acreage under potatoes in the country. Among the States, Mysore tops the list with 5,700 acres. Other States where potatoes are grown on a small scale are Patiala, Palampur, Mandi, Kashmir and a number of Simla Hill States.

The distribution of area under potatoes in the important provinces and States is discussed below.

In the United Provinces, the potato is an important cash crop and is grown in almost all districts. The total area under potato cultivation is about 161,800 acres, of which about 150,000 acres are in the plains and the balance in the hills. In the plains it is grown in winter and in the hills as a summer crop.

The principal potato producing districts in the plains which have a large surplus for export are Farrukhabad, Jaunpur, Meerut and Moradabad, whereas in the hills the important districts are Nainital and Dehra Dun. Some of the other districts such as Gorakhpur, Basti and Gonda which have fairly large areas under potatoes do not play such an important part in the general trade of the country, as the areas in these districts are scattered and the produce is largely consumed within the respective districts or in adjoining markets.

In Bihar, potatoes are cultivated mainly in the plains in the winter season, and the total area is estimated at 90,000 acres. Patna, Gaya and Darbhanga are the most important districts for potato cultivation from where large quantities are distributed both within and outside the province. Other districts such as Saran, Hazaribagh, Purnea, Monghyr and Shahabad also grow large quantities of potatoes, but they are not so important from the general trade point of view.

In Bengal, potatoes are mainly grown in the plains. Only about 1,200 acres out of the total area of 77,400 acres are located in the hills in the district of Darjeeling. Two crops are taken in the hills, one in summer and another in winter. The former is more important and more than two-thirds of the area in the hills is under this crop. In the plains, only one crop is taken in winter and the area is mainly concentrated in Rajshahi, Burdwan, Dacca, Presidency and Chittagong divisions. The total area under potatoes in these divisions amounts to 42 per cent, 29 per cent, 14 per cent, 9 per cent and 6 per cent respectively of the total area under this crop in the province. In the Rajshahi division the main potato producing districts are Rangpur and Bogra, which have 13,100 and 7,300 acres respectively. In the Burdwan division, the important potato producing districts are Burdwan, Hooghly and Birbhum with an area of 10,600, 6,300 and 2,100 acres respectively and they together constitute about 80 per cent of the total area under potatoes in this division. In the Dacca division, the two important producing districts are Mymensingh and Dacca, with a total area of 8,500 acres. The area in these and several other districts is scattered so that the production is of local importance only.

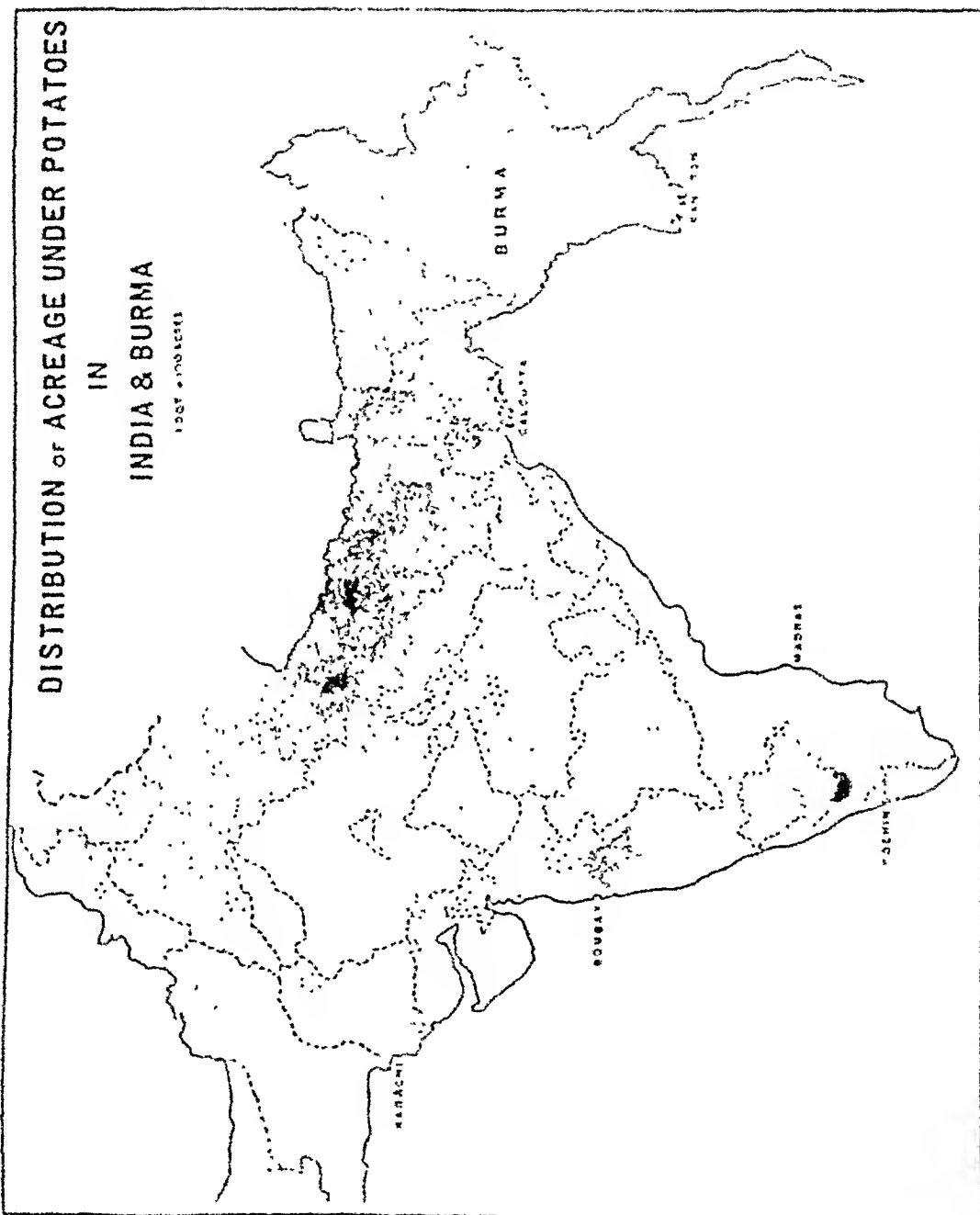
The area under potatoes in Assam is about 31,500 acres out of which 9,700 acres are in the hills, mainly in the Khasi and Jaintia Hills and the remaining 21,800 acres are distributed amongst several other districts, such as Darrang, Silchar, Kamrup, Goalpara, Sylhet and Nowgong with 3,882,

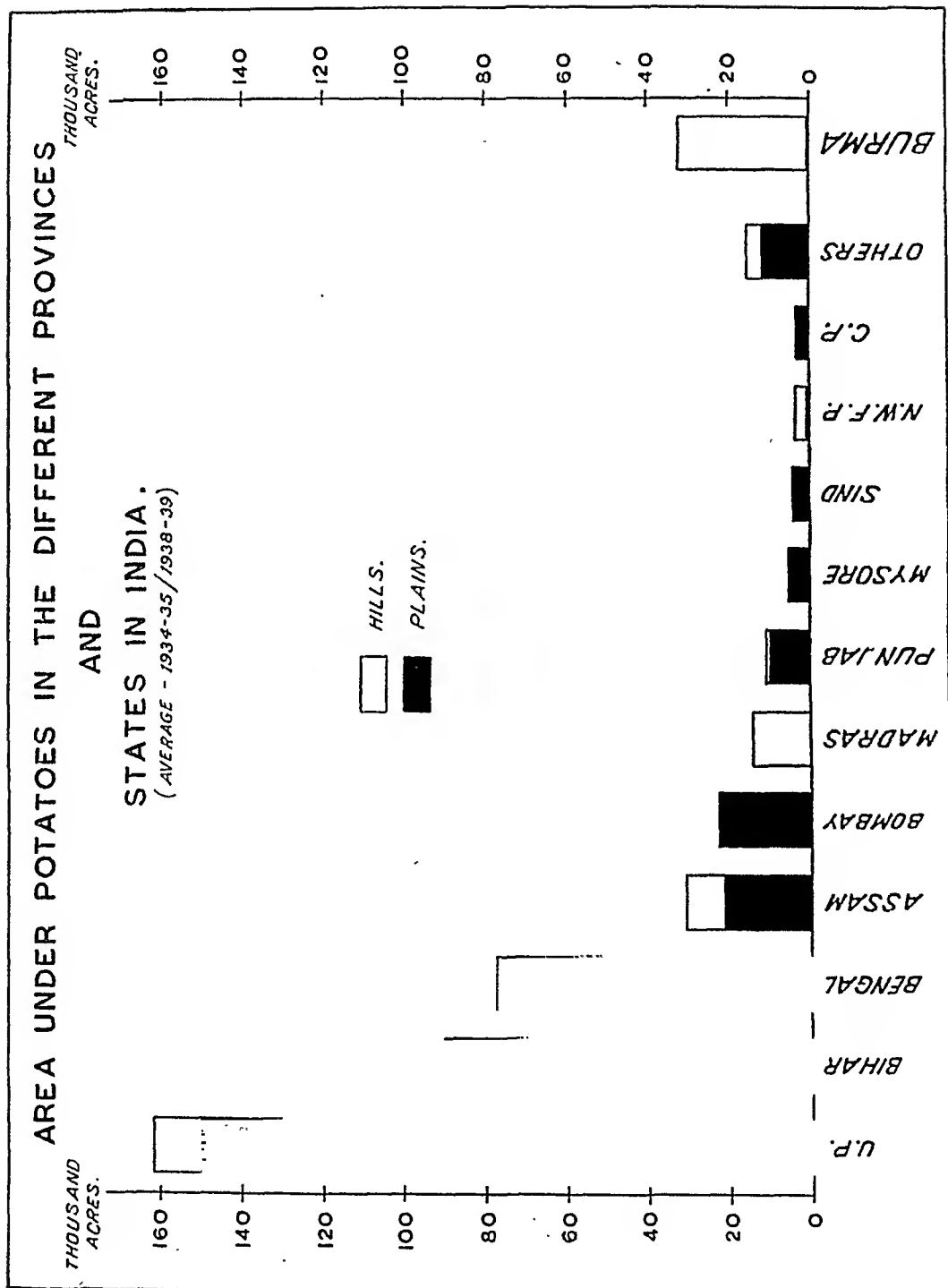
DISTRIBUTION OF ACREAGE UNDER POTATOES

IN

INDIA & BURMA

1907-1908





3,377, 3,009, 2,700, 2,402 and 1,395 acres respectively. The main crop in the hills is planted in summer and in the plains mainly in winter. The production of potatoes in the Khasi and Jaintia Hills is of considerable commercial importance outside the province while in other areas it is chiefly of local importance.

In the Bombay Presidency, the area under potatoes is 22,500 acres. Most of this is in the plains or in the Deccan and only about 100 acres are in the hills. About 58 per cent of the area in the plains is under summer crop and the remainder under the winter crop. Bombay is the only province where a fairly large area is put under the summer crop in the plains, the reason being a comparatively milder summer and the high altitude of the Deccan districts of Poona (1,850 ft.) and Satara (2,190 ft.). The important potato producing districts in the presidency are Poona, Satara, Nasik, Ahmednagar, Kaira, Dharwar, Belgaum and Ahmedabad. The Poona district is by far the most important as it accounts for more than 75 per cent of the total area in the province. Although the area in other districts is comparatively small, yet they are fairly important from a commercial point of view as the localities concerned have a fairly large surplus available for export. In Satara district, for instance, out of 2,627 acres grown, over 50 per cent are concentrated in Koregaon and Wai *talukas*. In the Belgaum and Dharwar districts, which have 270 and 535 acres under potatoes respectively, more than 90 per cent of the area in each case is to be found in the Belgaum and Dharwar *talukas*. The area under potatoes in the Ahmedabad district is entirely confined to the vicinity of the Ahmedabad city.

In the Madras Presidency, potato cultivation is confined to the hills. The total area under this crop is about 14,200 acres. The greater part of this is in Coonoor and Ootacamund *talukas* with 8,200 and 5,600 acres respectively. Only about 200 acres each are in Kodaikanal and Hosur. The Nilgiri Hills have a mild climate and the potatoes can be grown there throughout the year. However, the most favourable season is March to June when 9,900 acres of the total area is planted.

In the Punjab, potatoes are grown both in the hills and in the plains. The total area under this crop is 11,600 acres out of which 800 acres are in the hills mainly in the Simla, Kangra and Rawalpindi districts and the remaining 10,800 in the plains. The potato cultivation in the plains is spread over 23 districts but the central and sub-montane districts of Lahore, Jullundur, Ambala, Karnal, Amritsar, Sialkot, Ludhiana, Lyallpur and Gurdaspur are the more important. The areas of commercial production are mainly in the vicinity of big towns.

In the plains, a little less than one-fourth of the area (2,400 acres) is under the summer crop and the rest under winter crop, whereas in the hills the entire area is under summer crop as no winter crop can be raised due to frost.

In Sind, there being no suitable hills, potato cultivation is confined to the plains. The area is about 4,200 acres. A little over 85 per cent of this is under the winter crop and the rest under the summer crop. The important potato growing tracts are Malir and Bagirji which account for 63 and 28 per cent respectively of the total area in the province. The remaining 9 per cent is distributed in other tracts such as Sultan Bihan, Piryalo, etc.

In the Central Provinces, the area under potatoes is 3,400 acres. Out of this, 3,100 acres are planted in winter and the remaining 300 in summer. The chief producing tracts are the cooler regions of the province, such as

Jubbulpore, Chhindwara, Saugor, Khamlu, Hoshangabad and Pachmarhi. There are about 1,226 acres in Jubbulpore, 983 acres in Chhindwara, 502 acres in Saugor and 183 acres in Betul district. The remaining area is distributed in other districts such as Mandla, Amraoti, etc.

In the North-West Frontier Province, there are about 3,800 acres under potatoes, 84 per cent being in the hills and the rest in the plains. In the former case, the potatoes are grown mainly in the Hazara district and Kurram agency and in the latter mainly in the Peshawar district round about the city. In the hills, on account of a very severe winter, potatoes are grown only in the summer. In the plains also the winter being severe, about two-thirds of the area is under summer crop and one-third under the winter crop.

Orissa has a total area of 2,600 acres under potatoes out of which 2,300 acres are in Cuttack district and the remaining 300 are shared between Puri, Sambalpur and Balasore districts. The entire area in this province is in the plains and only the winter crop is raised.

In Baluchistan there are about 1,060 acres under potatoes out of which 342 acres are located in Pishin, 323 acres in Harnai, 228 acres in Quetta and the remaining 167 acres are distributed in other districts.

In Mysore, there are 5,700 acres under potatoes. 58 per cent of this area is under the winter crop and the rest under the summer crop. Bangalore and Kolar districts account for 80 per cent of the total area and the remaining 20 per cent is distributed in other districts such as Hassan, Tumkur, Kadur, etc. In the Bangalore district, the largest area lies in Hoskote and Anekal, i.e., 543 acres and 350 acres respectively. 459 acres are located in Bangalore and Dewanahally talukas. In the Kolar district, the important potato producing areas are Sidlaghatta, Malur and Kolar, each having 684, 659 and 400 acres respectively.

In other provinces and States the area under potatoes is rather small, the cultivation being confined to places near the local consuming centres.

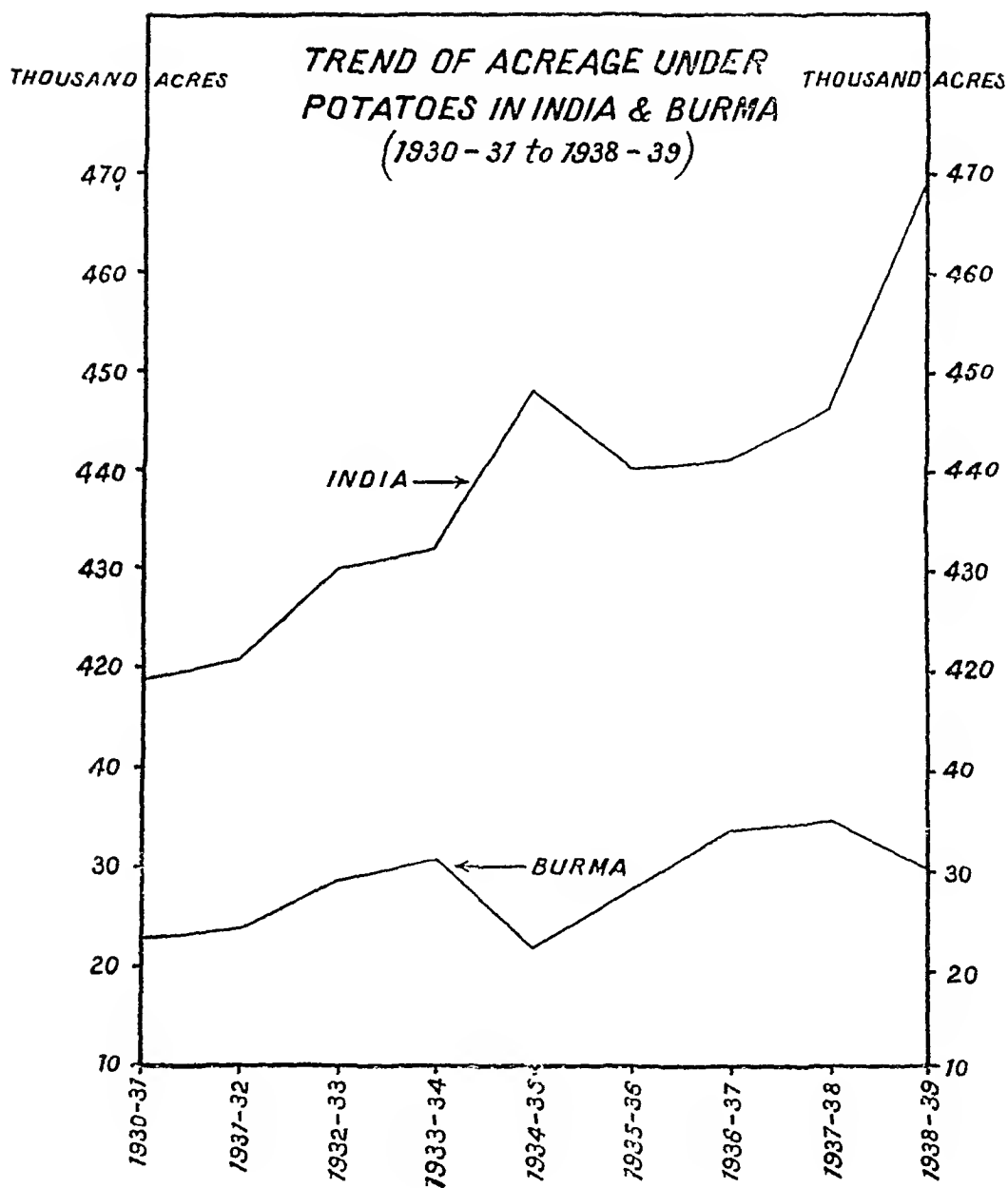
In Burma including Shan States, the area under potatoes in 1938-39 was roughly 29,600 acres. Out of this, 25,500 acres were in Shan States and 4,100 in Burma proper. The cultivation is concentrated chiefly in the Myelat area round about Aungban and Heho in Southern Shan States, and in Nawnghkio area in the North Shan States, and Bhamo, Mandalay, Kyan and Myitkyina in Burma proper. About 92 per cent of the area is under the summer crop and the remaining 8 per cent under winter crop.

(c) *Trend of acreage.*—The estimated area under potatoes in different important provinces and States for the period 1930-31 to 1938-39 is given in Appendix V and the total area in India in different years is given in the following table (see diagram facing this page):—

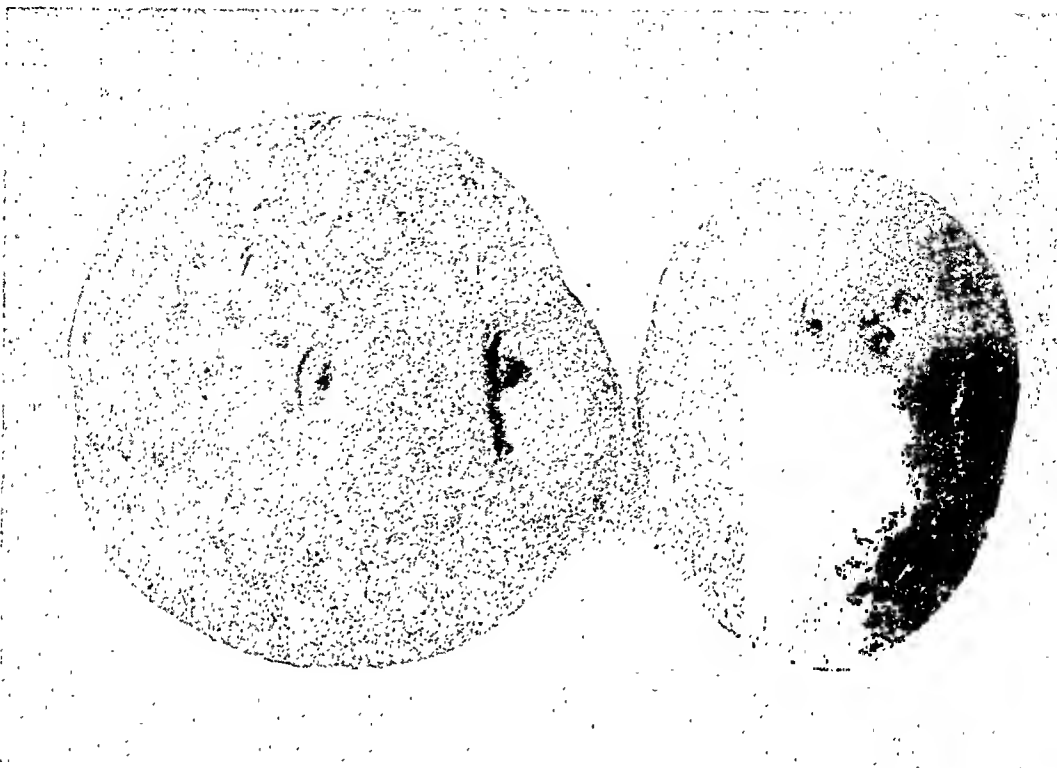
*Estimated area (in acres) under potatoes in India during 1930-31 to 1938-39.*

1930-31	.	.	.	.	.	419,300
1931-32	..	.	.	.	.	421,200
1932-33	.	.	.	.	.	430,400
1933-34	.	.	.	.	.	431,600
1934-35	.	.	.	.	.	448,400
1935-36	.	.	.	.	.	439,600
1936-37	.	.	.	.	.	441,000
1937-38	.	.	.	.	.	445,700
1938-39	.	.	.	.	.	468,700

From the foregoing table it appears that there has been a progressive increase from 419,300 acres in 1930-31 to 448,400 in 1934-35. In 1935-36 there







GREAT SCOT.



UP-TO-DATE.

was a fall of about 8,800 acres. This was mainly confined to the United Provinces and was due to the fall in prices in the local markets in the previous year. From 1935-36 onwards, there was again a gradual rise and the area increased to 468,700 acres in 1938-39. According to the available figures there has been an increase of 49,400 acres equal to about 11.8 per cent since 1930-31 in the country as a whole. But there have been great fluctuations in the different provinces and States, the position in regard to which is discussed below.

In the United Provinces, the area under potatoes remained almost steady from 1930-31 to 1933-34. In 1934-35 there was an increase of 10,400 acres due to comparatively high prices in the previous year, but in 1935-36 there was again a drop of 12,100 acres and from then onwards there has been a gradual decline till 1937-38 when the area was 153,800 acres which is about 18,600 acres less than the maximum area recorded in 1934-35. The prices in 1937-38 were high on account of smaller production and so in the following year the area increased again by about 15,000 acres.

In Bengal, the acreage has gradually increased from 60,500 in 1930-31 to 88,000 acres in 1938-39. This gives an increase of 45 per cent and was due to an increasing demand for potatoes in the province. The annual increase in area from 1932-33 to 1934-35 was about 2,700 acres per annum. In 1935-36 there was an increase of about 4,000 acres. After this, the increase was much greater ranging from ten to eighteen thousand acres per annum.

In Bihar and Assam, the acreage figures for a number of years in the past are not available. It is, however, quite likely that there have been no significant fluctuations during the past four or five years. It is estimated that the areas in these two provinces have been in the vicinity of 90,000 and 31,500 acres respectively.

In Bombay, the area has increased from 19,800 acres in 1930-31 to 23,400 acres in 1938-39. There were fluctuations in the intervening period. It gradually increased from 1930-31 to 1932-33 when it was 24,200 acres. In 1933-34 it declined to 21,700 acres and again rose to 23,100 in the following year. In the succeeding three years, there was a gradual fall and in 1937-38 it went down to 21,500 acres. In 1938-39 there was again an increase of about 2,000 acres. The fluctuations were mainly due to variation in prices and the difficulty of getting seed for planting. During the last 25 years or so the area under this crop has increased considerably in the presidency. In the Poona district, for instance, the area increased from 6,026 acres in 1914-15 to 16,993 acres in 1938-39.

In the Madras Presidency, the area under potatoes fluctuated between 8,111 and 8,664 acres during 1923 to 1929 and thereafter it started increasing. In 1930-31 it was 10,600 acres but it gradually rose to 15,400 acres in 1937-38. It is stated that previously the cultivation was confined to fields in the neighbourhood of villages where cattle manure was easily available. In recent years, the use of artificial manures has become popular and the cultivator no longer depends upon farm yard manure. The system of advancing manure on credit has enabled even the poorest cultivator to grow this crop. This has been further encouraged by the development of motor lorry traffic which has facilitated the movement of produce from the Nilgiri Hills to Mettupalaiyam, which is the main assembling market for potatoes in the presidency. Added to this is the influence of the Agricultural Research Station at Nanjanad, which has been able to introduce varieties like *Great Scot* (see plate facing

page 9) and *Ben Cruachan* which are greatly in demand in Bombay, Bengal and Orissa markets.

In the Punjab, the area under potatoes has increased since 1930-31 when it was 9,600 acres. In 1931-32 it increased by 1,100 acres, but a marked expansion occurred in the next year recording a maximum increase of 1,400 acres over the previous year. In 1933-34 the area decreased by about 300 acres and in 1934-35 there was a further decrease of about 200 acres. The province as a whole has recorded an increase of over 20 per cent from 1930-31 to 1934-35. The expansion in area has not taken place uniformly in all the districts. In some districts such as Ambala, Karnal, Gurdaspur, there has been a decrease. The increase in area has occurred mainly in Ferozepur, Lyallpur, Ludhiana, Amritsar and Jullundur and seems to be due to the growing demand for potatoes in the large neighbouring towns.

The area \* under potatoes in Burma including the Shan States has increased during the past nine years (see Appendix V). In 1930-31 it was 23,400 acres, but it gradually increased and was 31,400 acres in 1933-34. In the succeeding year it declined to 22,300 acres, but gradually rose again to 34,900 acres in 1937-38. In 1938-39 there was again a fall and the area was reduced to 29,600 acres.

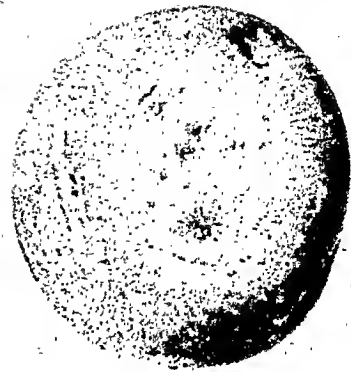
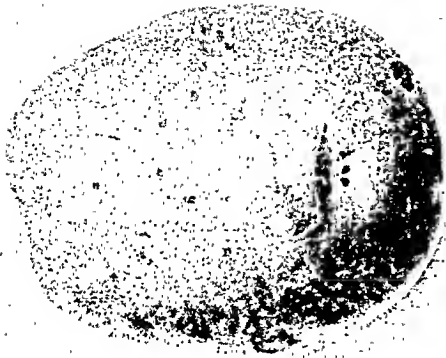
Acreage in the Shan States, which accounts for the major portion of the area under potatoes in Burma, has definitely shown an upward trend. The causes for this are firstly, the increase in demand for the produce in the Indian markets and secondly, the development of easy means of transportation, e.g., opening of Thazi-Kalaw railway (1915) with extension to Heho (1921) and Hwencyaung (1928). The diagram facing page 8, however, shows considerable variations during 1930-31 to 1938-39. The variations were probably due to climatic conditions as well as prices.

(d) *Area under different varieties.*—Most of the varieties commonly grown in India have been imported in the past from Europe and North America, e.g., the *Up-to-date* (see plate facing page 9), *Great Scot*, *Raccia* (Italian) and the so-called *desi* varieties of which there are several known by various names in different parts of the country. The *desi* varieties are also considered to be imported varieties which have become acclimatised and of which the original names have been lost.

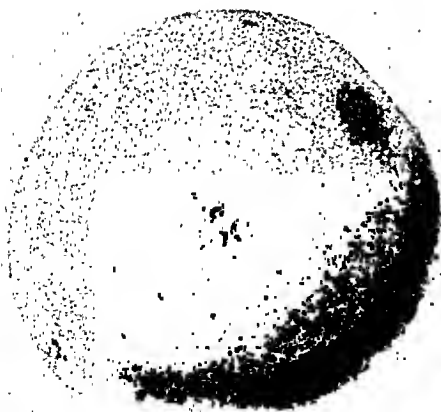
There is a great confusion and no uniform system exists of naming the varieties. The most common convention adopted is to name a variety after the locality in which it has been grown for some time, e.g., *Jullunduri*, *Farrukhabadi*, *Dharwar*, *Pahari* (hill potato), *Kangra Local* (a local potato of Kangra). Another common practice is to designate a variety by one or more of its most noticeable attributes, thus *Phulwa*, a variety that flowers, *Lalwa* (red skinned), *Sufeda* (white skinned), *Gola* (round), *Khera* (long like cucumber), *Sufed Gola* (white round), are some examples of this kind of nomenclature. Sometimes a name may indicate both the locality as well as the outstanding feature of the variety. Examples of this are *Patna Sufeda* (white potato from Patna), *Farrukhabad Phulwa* (a flowering variety from Farrukhabad) and *Dehra Dun Gola* (round potato from Dehra Dun). Very often the same variety is designated by a number of different names and conversely different varieties may be designated by the same name. From the marketing point of view, particularly in the matter of grading, and from the point of view of production so far as seed is concerned, it is necessary that all doubts about the identity of the different varieties of potatoes should be cleared up.

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\* Based on estimated production figures.



PHULWA.



GOLA.



DARJEELING RED.



MAGNUM BONUM.

Dr. Pal, the Imperial Economic Botanist, collected about 300 samples of different varieties of potatoes grown in the important producing areas in 1934-35, and after two years' study he was able to identify many of the synonymous stocks (see Appendix IV).

The work of classification is being continued and last year the Agricultural Marketing Adviser to the Government of India collected the important commercial varieties numbering 106 from all over India and Burma and they were grown by the Imperial Economic Botanist with a view to finding out whether each represents a pure variety or is a mixture of different varieties, and also to clear up the question as to what botanical varieties are represented by commercial trade names. The samples were examined carefully at the time of receipt and they were later grown to determine any mixture from the foliage and flower characters; the number of types noted in the different samples are detailed in Appendix VI. The samples were planted in the field in the Botanical Section of the Imperial Agricultural Research Institute. Only a preliminary study could be made as most of the varieties fail to flower in the plains of India, and unless the flower characters are known it is difficult to identify varieties with any reasonable degree of certainty. For this reason, the collection will again be planted at the Potato and Wheat Breeding Sub-Station, Simla, where the final identification will be done. After this investigation has been completed it will be possible to say definitely whether *Phulwa* from the United Provinces is the same as *Phulwa* from the Punjab and whether the stocks are pure in each case. The results of this research would be of value in the classification and grading of potatoes which are urgently needed, as the present trade classifications differ from place to place and cannot be relied upon with the result that personal inspection of the produce before purchasing is necessary in nearly every case.\*

On the basis of observations made so far, all the commercial varieties can be divided provisionally into the three following groups:—

1. *Desi* varieties.
2. European varieties.
3. Miscellaneous (unclassified).

The first group includes all those so-called "country" varieties which cannot be identified with known European varieties while the second group comprises those varieties which resemble the known European varieties in every respect and are doubtless identical with them. The third group comprises those varieties which it has not been possible to identify as yet.

From the trade point of view all the commercial varieties of potatoes grown in India can be classified further as "White" and "Coloured", and "Round" or "Oval". The details of the different groups with the varieties which appear to fall into them are given below. In cases of doubt a question mark follows the name of the variety. (Please see also Appendix VII).\*

1. *Desi varieties*.—Among *desi* varieties we have 3 important groups namely, *White Round*, *Coloured Round* and *Coloured Oval*.

*White Round*.—Potatoes falling into this group can further be classified as *Phulwa* type and *Gola* type.

*Phulwa type*.—This is one of the very few varieties that flower freely in the plains of India, hence its common name *Phulwa* (variety that flowers). In this type there are two forms, one with white skin and the other with purple splash. The tubers of the latter type resemble those of the former in every respect with the difference that the skin shows purple splashes, varying in

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\*The final classification on the basis of trials at the Potato and Wheat Breeding Sub-station, Simla, have since been received from Dr. Pal (see Appendix XXXIII).

extent and intensity. It is not recognised as a distinct variety in the common trade but is often found as a mixture in the *Phulwa* white type of potatoes. This variety has in all probability arisen from *Phulwa* variety. Varieties having the purple splash are *Bogra* (b), *Kalva* (b) and *Desi Red* (b).

The tubers of the *Phulwa* type are round and small in size, and have white smooth surface with medium deep eyes, often crowded at the crown end, picked out in purple especially at the crown, eyebrows slightly developed. (See plate facing page 10). This type appears to pass under the following names :—

*Bogra* (a), *Mahasu* (a), *Phulwa*, *Desi*, *Patna*, *Satha* or *Asla* (white), *Karachi*, *Dehra Dun* (a), *Patna White*, *Kalva* (a), *Madraji*, *Shan*?, *Darjeeling White Round*, *Phulwa*, *Gola*, *Batia* (a), *Deshi*, *Jullunduri*, *Farrukhabadi* and *Desi White*.

The *Satha* tubers resemble *Phulwa* in every respect but it is claimed that the plant differs from the *Phulwa* inasmuch as it is small and bushy and the crop matures in 65 to 75 days as against  $3\frac{1}{2}$  to 5 months in the case of common *Phulwa*. *Satha* is possibly a wilding type of *Phulwa*.

*Gola type*.—It has medium size tubers, which are round but slightly tapering towards the crown with a recess at the heel, sometimes irregular. The skin colour is white, surface smooth but occasionally netted, eyes deep, often crowded at the crown, eyebrows long and prominent. (See plate facing page 10). Varieties resembling this type and probably identical with it pass under the following names :—

*Gola*?, *Khira* (e)?, two monthly (*Domahi*), three monthly (*Semahi*), *Pahari*, *Gola Chonchiya*, *Gola Market Phulwa* (b), *Gola Kalma* and *Batia* (b)?.

The main difference between the *Gola* and the *Phulwa* type of potatoes is that the tubers in the former case are not perfectly round and that they have deep eyes with long prominent eye-brows and that the crop is ready in 65 to 75 days as against  $3\frac{1}{2}$  to 5 months in the case of the *Phulwa* type.

*Tubers Coloured*.—The varieties belonging to this group can be classed as *Round Coloured* and *Oval Coloured*. The former type is more important commercially than the latter.

*Coloured Round—Darjeeling type*.—The tubers in this case are small to medium in size, round in shape, with red skin having rough surface (occasionally smooth, especially in young tubers) eyes medium deep and eye-brows slightly developed. (See plate facing page 11). The samples resembling this type and probably identical with it are :—

*Lal alu* (b), *Pakri*, *Patna*, *Jullunduri*, *Surkh* (a) and *Katoi* (*Patna Red*).

*Coloured Oval—Silbilati type*.—The tubers of this variety are small in size and have oval, elongated, irregular shape, reddish purple skin, smooth surface, very deep eyes and prominent eye-brows. Included under this type appear to be two varieties grown in Bengal, namely, *Silbilati* and *Sindurfuti*.

These *desi* varieties are cultivated mainly in the plains and appear to owe their popularity to their ability to withstand heat and drought and also to some extent the diseases which are common in the plains.

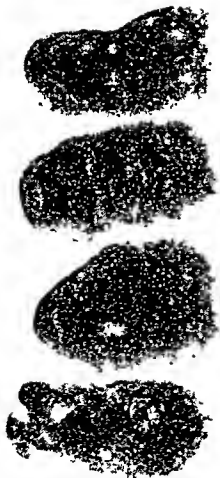
2. *European varieties*.—Almost all the European varieties grown in this country on commercial scale have white tubers and, according to shape, can be classified as round and oval. The important varieties which have white round tubers are *Great Scot*, *Epicure*, *Arran Consul*, *Ben Cruachan*, *Italian*



KHABRAB.



LONG BEAN.



LONG KEEPER.





ITALIAN WHITE ROUND.



ITALIAN WHITE LONG.

*White Round (Raccia)*, and those which have white oval tubers are *Royal Kidney*, *Up-to-date*, *Dunbar Cavalier*, *Long Bean*, *Long Keeper*, *Kangra Local*, *Nainital*, *Rangoon*, *Gauhati*, *Ally*, *Arran Banner*, *Inverness Favourite*, *Italian White Long*.

The description of the different varieties is given in Appendix VIII. The well known trade name for most of the European varieties particularly of the oval type is *Nainital*. This name is most commonly applied to the *Up-to-date*, *Magnum Bonum*, (see plate facing page 11) and *Royal Kidney* or to a mixture of these three or more of the oval type of potatoes.

3. *Miscellaneous varieties*.—In this group are included the varieties which cannot appropriately be put under any of the groups mentioned above. However, on the basis of shape and colour, they can also be classified as white and coloured and round and oval as shown below :—

*Unidentified varieties.*

White Round.	White Oval.	Coloured Round.	Coloured Oval.
Deesa . . .	Ricket . . . Pahari . . .	Lal Alu (a) . . Katuwa (b)	Khira (c)
Natu . . .	Bengala . . . Dhamtauri . .	Gola Pathankot Tirahi	Red Long

From the foregoing account it is evident that there is a great need for the identification and classification of the various varieties grown in different parts of India. From the preliminary study, however, it has been determined that while quite large number of varieties (probably about 30) are grown in different parts of India to a smaller or larger extent, the varieties actually important from the commercial point of view are few and their number probably does not exceed about eight. These are given below :—

*Varities grown in the plains—*

*Phulwa*

*Darjeeling Red Round*

*Gola*

*Italian White Round*

*Varities grown in the hills—*

*Magnum Bonum*

*Up-to-date*

*Darjeeling Red Round*

*Royal Kidney*

*Great Scot*

Because of the confusion regarding varietal names, it is not possible to estimate with any precision the area under each variety. The survey of marketing has, however, revealed that *Phulwa* which is known as *Patna*

*White, Sufeda Farrukhabadi, Darjeeling White*, etc., in different localities is widely grown in Bihar, the United Provinces and parts of Bengal and the Punjab. Its popularity in Northern India must probably be attributed to its adaptability, freedom from diseases (except mosaic in certain districts, other diseases are rare) high yielding capacity and outstanding keeping quality. The last factor is of supreme importance in the long and hot Indian summer. The next important variety grown largely in Northern India is the *Darjeeling Red*, which in different parts is known as *Cawnpuria, Lalka, Katuwa, Patna Red*, etc. This is largely grown in the Punjab, the United Provinces, Bihar and Bengal. This variety has a comparatively short growing period and is popular where frost occurs. The seed potatoes of this variety are brought down from the hills but in a short time the original stock apparently deteriorates. It is a poor keeper.

*Gola* is another important variety which is grown largely in the Punjab, Baluchistan and parts of the United Provinces. It has a shorter growing period than *Darjeeling Red* and is grown in parts where there is a danger of frost or an early crop has to be taken.

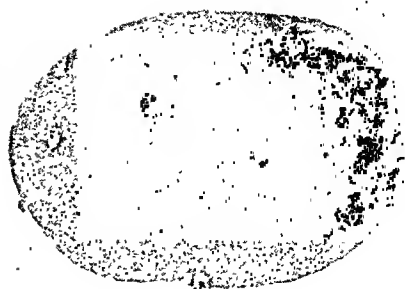
In Western India, comprising the Bombay Presidency, Sind, Baroda, Palanpur and Gwalior States and also Mysore and Hyderabad States in South India, the variety largely grown is the *Italian White Round (Raccia)*.

In the hills, some of the better known European varieties such as *Great Scot, Magnum Bonum, Up-to-date, Darjeeling Red Round, Long Keeper, Royal Kidney, Long Bean, Arran Consul, Ally, Ben Cruachan, Factor*, etc., are grown. The Nilgiri Hills grow mainly the *Great Scot* and to a small extent *Royal Kidney* and *Ben Cruachan*; the Kumaon Hills *Long Keeper, Long Bean* and *Agar*; Assam Hills *Arran Consul, Factor* and *Up-to-date* and to a small extent *Great Scot*.

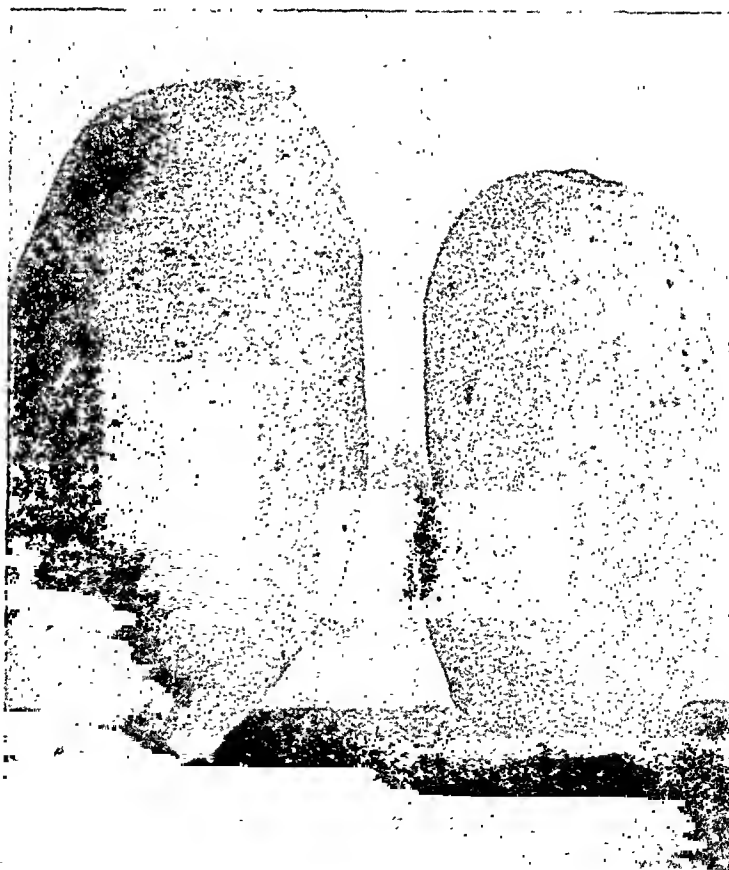
In the absence of authentic information, enquiries were made from producers about the relative importance of each of the commercial varieties and a rough estimate of the areas under different varieties is given below.

**United Provinces.**—In the plains of the United Provinces, the *Phulwa* type of potatoes comprising the varieties locally known as *Kabra, Bhutani, Madrasi, Patna White*, etc., are grown extensively and account for about one lakh acres or nearly two-thirds of the total area under potatoes in the plains. The districts where they are largely grown are Farrukhabad, Jaunpur, Meerut, Allahabad, Azamgarh, Fyzabad and Basti. The *Gola* type comes next in order of importance with an area of about 23,600 acres and is mainly grown in Dehra Dun, Meerut, Muzaffarnagar, Agra and Shahjahanpur districts. The *Darjeeling Red* type with an area of 17,000 acres or nearly one-ninth of the total area in the plains comes third in order of importance. It is largely grown in the districts of Bareilly, Ghazipur, Gorakhpur, Mirzapur, Unao, Hardoi and Etawah.

The varieties grown in the hills of the United Provinces are of the *White Oval* type and are commonly known as *Nainital* or *Pahari*. Of all the varieties in this group, the *Long Keeper* variety (see plate facing page 12) is grown most widely and covers an area of 2,900 acres or 25 per cent of the total area under potatoes in the hills. Next in order of importance comes the *Long Bean* (Garhwal) variety (see plate facing page 12) which has an area of about 2,400 acres and is grown in the Almora, Garhwal and Nainital districts. Third in order of importance is the *Agar* variety which has an area of 1,767 acres and is grown mainly in the Nainital district. *Khabrar* (see plate facing



MOMBASSA KIDNEY.



ROYAL KIDNEY.



RICKETS.



MOUNTAIN.

page 12), which is one of the indigenous hill varieties, is also grown on a fairly large scale in almost all hill districts of the province. The area under this variety is about 1,200 acres.

**Bihar.**—There are three main varieties in Bihar, namely the *Phulwa*, *Satha* and *Surkha*. The first two belong to the *White Round* type of potato and the last one to the *Coloured Red* type, i.e., *Darjeeling Red*. The *Satha* and the *Phulwa* together cover most of the area under potatoes in the province. The *Satha* variety is largely grown in the Bihar Sharif tract while the *Phulwa* and *Darjeeling Red* or *Surkha* are grown mostly around Patna.

**Bengal.**—The variety grown largely in Bengal Presidency is *Nainital* type which covers a group of *Oval White* varieties such as *Up-to-date*, *Magnum Bonum*, *Royal Kidney*, etc. The total area under this type is approximately 20,000 acres or 25·8 per cent of the total area under potatoes in the province. It is grown mainly in Hooghly, Burdwan, Mymensingh, Dacca and Murshidabad districts. The next important variety is the *Phulwa* type, the area under which is about 8,900 acres or 11·5 per cent of the total area under potatoes in the province. It is grown mainly in the Bankura, Howrah, Burdwan, Hooghly and Midnapore districts, the area in each district being 6,000, 1,000, 900, 600 and 400 acres respectively. Other varieties grown are *Silbilati* and *Sindurfuti* type which have coloured oval tubers and together occupy about 7,700 acres. These are grown mainly in the Rangpur and Bogra districts.

The other important variety grown in Bengal is the *Darjeeling Red* type which is locally known as *Pakri*. It is grown mainly in the Rajshahi and Bogra districts and has a total area of about 6,000 acres. Next in order comes a so-called *Rangoon* variety which is a mixture of *Magnum Bonum* and *Up-to-date* varieties and is grown over about 5,600 acres mainly in the Chittagong, 24-Parganas, Midnapur and Bankura districts.

**Bombay.**—Bombay is one of the few provinces in India where there is not much confusion regarding varieties. The *Italian White Round* or *Raccia* (see plate facing page 13) is the only variety which is extensively grown all over the presidency. The area under this is estimated at 96·0 per cent of the total area under potatoes in the presidency. It is grown in all the potato producing districts excepting Ahmedabad and Mahableshwar where the *Italian White Long* variety (see plate facing page 13) is largely grown. In the latter place, the *Mombassa Kidney* (see plate facing page 14) variety is also grown to a small extent.

**Madras.**—In the Madras Presidency also there is very little confusion about the varieties. The largest area in the Presidency is under *Great Scot* variety which covers 9,000 acres out of a total of 14,200 acres in the presidency. Out of this, 5,000 acres are concentrated in the Ootacamund *taluka* and 4,000 acres in Coonoor *taluka*. The remaining 5,200 acres under potatoes are under other varieties such as *Royal Kidney*, (see plate facing page 14), *Ben Cruachan*, *Late Carman* and *Arran Comrade*.

**Punjab.**—The important varieties grown in the Punjab are *Darjeeling Red* or *Surkha*, *Phulwa* and *Gola*. The combined area under these varieties amounts to 9,500 acres or about 82 per cent of the total area under potatoes in the province. The *Darjeeling Red*, locally known as *Patna Surkha*, is most important of all the varieties grown in the Punjab and is grown on about 4,300 acres or 37 per cent of the total area under potatoes in the province. It is grown mainly in the Lahore, Amritsar, Multan, Sialkot and Montgomery districts, the area being 748, 357, 384, 335 and 309 acres respectively. To a

small extent it is also grown in other districts such as Ferozepur, Gujranwala, Jullundur and Ludhiana over an aggregate area of about 800 acres. The next important type of potatoes grown in the plains is the *Phulwa* type, which has an area of 2,800 acres. It is grown in the Lahore, Jullundur, Montgomery and Ferozepur districts. Third in order of importance is the *Gola* type which covers an area of 1,400 acres and is mainly grown in Amritsar, Jullundur and Sialkot districts. The other important variety grown in the Punjab is *Khera Chamba* which has not been identified. It is grown on a fairly large scale in the districts of Lahore, Jullundur and Ferozepur over an aggregate area of about 880 acres.

*Central Provinces.*—The largest area in the province is under the *Nainital* type of potatoes. It covers about 40 per cent of the total area under potatoes in the province. Next in order of importance are the *Phulwa* and *Italian White Round* and *Farrukhabadi* varieties, covering respectively 30, 24 and 5 per cent total area in the province. The remaining one per cent of the area is under the *Deshi* variety. The *Nainital* and *Italian* varieties are grown mainly in Jubbulpore, Murwara, Saugor and Pachmarhi districts; the *Phulwa* type mostly in Chhindwara and the *Farrukhabadi* in Jubbulpore and Murwara districts.

*Sind.*—The varieties largely grown in Sind are the *Italian White Round* and the *Italian White Long*, the former covering a comparatively bigger area. To a small extent the *Phulwa* type of potatoes are also grown. This type gives the highest yield if the crops escape frost. But as its growing period extends up to 5 months the crop is frequently affected by frost and is for this reason being gradually replaced by the *Italian White Round* variety, which has a comparatively short growing period and is harvested before the frost comes.

*Mysore State.*—In Mysore, 65 per cent of the total area or 3,814 acres is under *Italian White Round* variety (*Dharwar*) and 30 per cent or 1,760 acres under *Rickets* type (see plate facing page 15), which has not been identified, and the remaining 5 per cent or about 300 acres are under several other European varieties such as *British Queen*, *Mountain* (see plate facing page 15), *Naples*, etc.

*Burma.*—The varieties grown on a commercial scale in Burma are locally known as *Sitbo*, *Bengala* and *Shan*. Under *Sitbo* are grouped some of the best commercial varieties of western countries such as *Up-to-date*, *Ally*, *Puritan* and *Great Scot*. *Up-to-date* and *Ally* are grown more extensively than the others. *Bengala* is a *White Oval* variety. *Shan* is the indigenous variety and is grown on a small scale. This variety resembles the *Phulwa* type grown in India.

### C.—Production.

#### (1) YIELD PER ACRE.

Unlike wheat, rice, linseed, etc., there are no records of the yields of potatoes. It is, therefore, difficult to have an accurate idea of the yield in different producing centres. The potato is an important money crop and is worth about nine and a half crores of rupees. In view of its economic value it seems desirable that yield determinations should be made regularly on the lines of the crop lifting experiments carried out in the case of wheat, rice, etc.

In the absence of official statistics regarding yield, extensive enquiries were made from producers and officials of the Department of Agriculture and

rough estimates of the average yield of different crops were formed which are shown in the following table :—

*Average yield of potatoes per acre in maunds.*

	Plains.		Hills.		Weighted average.
	Summer.	Winter.	Summer.	Winter.	
United Provinces . . . .	..	145	73	..	140
Bihar . . . . .	..	105	..	..	105
Bengal . . . . .	..	89	70	70	89
Assam . . . . .	..	67	70	23	67
Madras . . . . .	..	..	110	78	100
Punjab . . . . .	90	150	100	..	134
Bombay* . . . . .	60	80	75	..	73
Sind† . . . . .	60	80	..	..	92
Central Provinces . . . .	..	100	50	..	95
North-West Frontier Province	85	85	100	..	98
Orissa . . . . .	..	65	..	..	65
Mysore‡ . . . . .	109	127	..	..	119
Hyderabad . . . . .	..	100	..	..	100
Patiala . . . . .	..	65	150	..	132
Gwalior . . . . .	..	40	..	..	40
Jammu and Kashmir . . .	140	200	50	..	128
Burma . . . . .	..	59	..	..	59
Average for India . . .	..	..	..	..	109
Average for Burma. . .	..	..	..	..	59

The yield per acre varies from season to season, from province to province, and from place to place in the same province. It depends on a number of factors such as soil, time of planting, cultural operations, variety, irrigation facilities, quality and extent of damage by frost, pests and diseases. In the plains, the largest yield per acre in the case of winter crop may be as high as 200 maunds in Kashmir, 150 maunds in the Punjab, or 145 maunds in the United Provinces or it may be as low as 40 maunds in Gwalior, 65 maunds in Orissa and Patiala, or 67 maunds in Assam. The yield of the summer crop varies from 60 maunds in Bombay and Sind to 140 maunds in Kashmir.

\*Figures are based on the yield obtaining in Poona, Satara, Nasik and Ahmednagar districts.

†Figures are based on the yield obtaining in the Malir tract.

‡Figures are based on the yield obtaining in Bangalore and Kolar.



According to these figures the highest yields are obtained from the winter crop in the plains. In the case of the hill crop, the yields are higher in summer than in winter. The former may be as high as 150 maunds per acre in Patiala, 110 maunds in Madras or 100 maunds in the North-West Frontier Province and the Punjab and as low as 23 maunds in the winter season in Assam.

The average yield per acre in India as compared with some of the important potato producing countries of the world is low as may be seen from the following table (see also diagram facing this page):—

*Average yield\* of potatoes in different countries per acre.*

Country	Yield per acre. (In maunds)
Belgium . . . . .	224
United Kingdom . . . . .	183
Germany . . . . .	178
Austria . . . . .	145
Czechoslovakia . . . . .	139
Poland . . . . .	127
France . . . . .	119
India . . . . .	109
Burma . . . . .	59

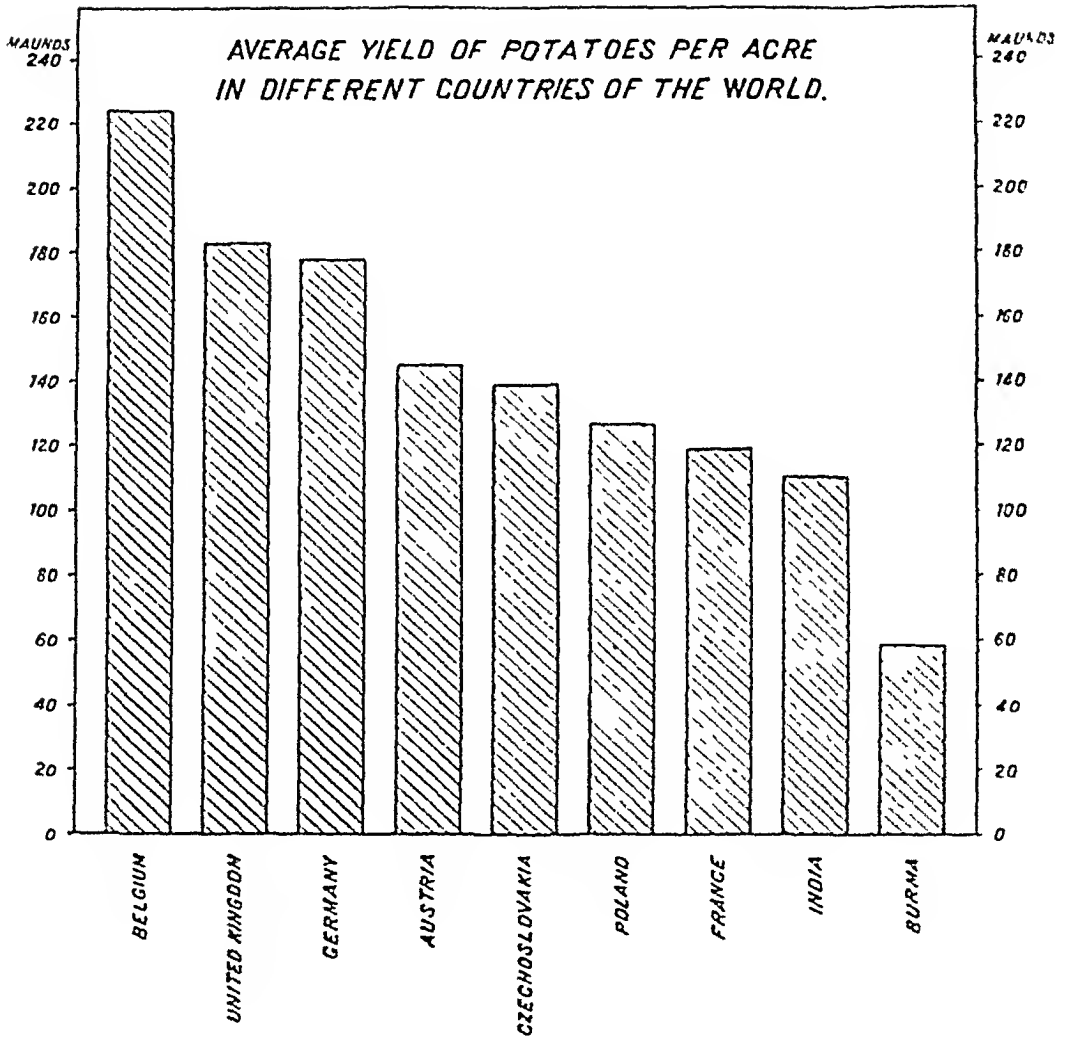
It will be seen that Belgium tops the list with an yield of 224 maunds per acre. The poor yield in India is mainly attributed to a relatively low standard of cultivation and to the fact that the cultivators do not attach proper importance to the quality of seed. There is, therefore, scope for more research work on the improvement of quality and yield and for the organisation of seed supplies and credit to the cultivators for the purchase of seed, manure, etc.

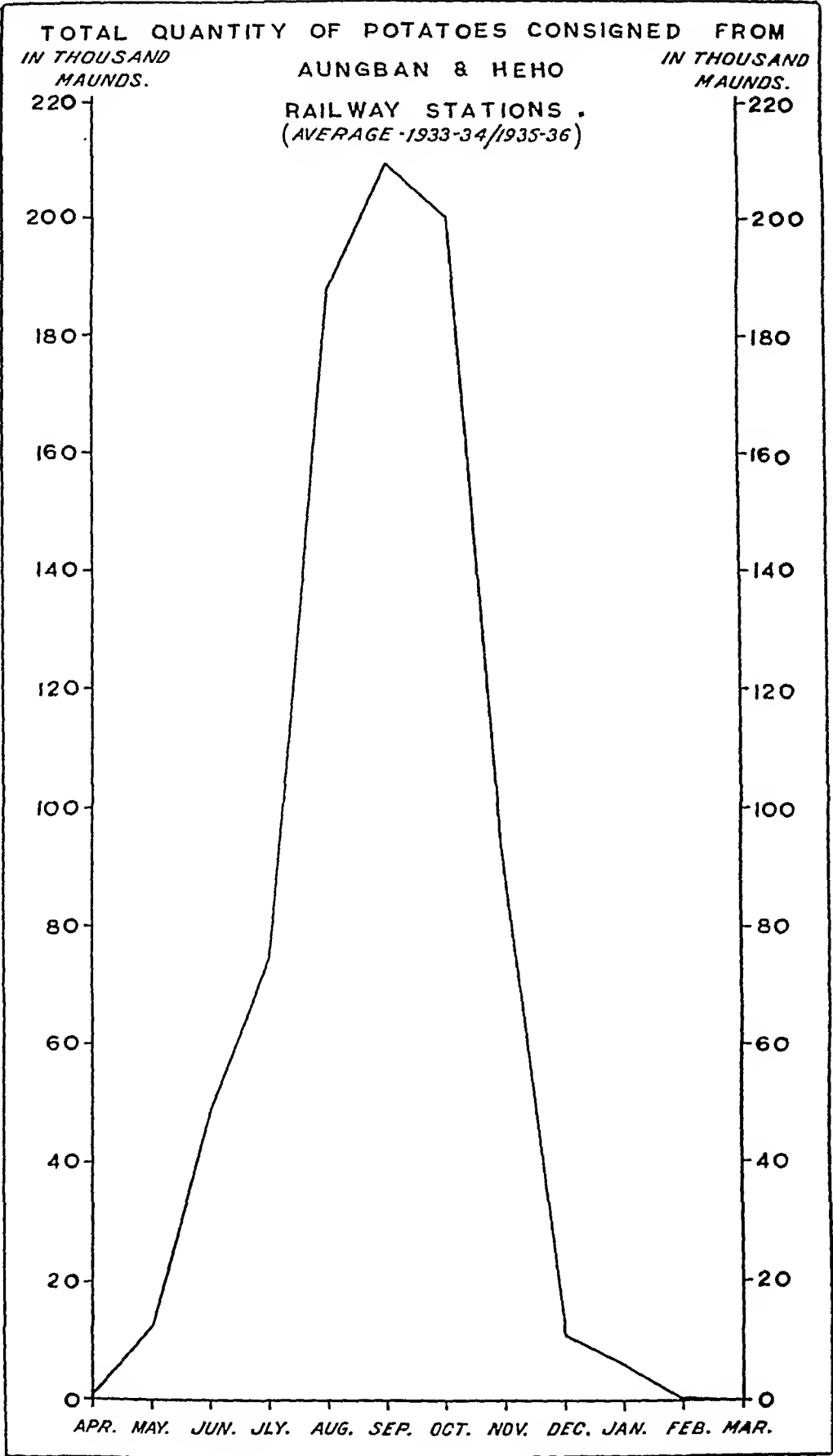
In Burma, three crops of potatoes are raised—"summer crop", "rain crop" and "winter crop". The estimated yields are 65 maunds, 54 maunds and 90 maunds per acre respectively. The average yield for Burma as a whole works out at 59 maunds per acre which is much less than that of India. This is perhaps due to the crops being grown mainly in the hills with a low standard of cultivation.

## (2) TOTAL PRODUCTION.

India produces annually 49,102,700 maunds of potatoes. Of this 45,304,500 maunds are produced in the plains and the remaining 3,798,200 maunds in the hills. In the plains, the summer crop yields 1,372,000 maunds and the winter 43,932,500 maunds. In the hills, the former yields 3,389,200 maunds and the latter 409,000 maunds. Taking the country as a whole, i.e., the plains and the hills together, it is found that total production of the winter crop amounts to 44,341,500 maunds and that of the summer 4,761,200 maunds. The estimated quantities of potatoes produced in the plains and the hills in different seasons in some of the important potato producing provinces and States are shown in the following table:—

\* International Year Book of Agricultural Statistics.







From the preceding table it will be seen that in all the potato producing areas in the plains the supplies from the winter crop are much more than those from the summer crop while in the case of the hills the position is quite the reverse owing to differences in conditions.

Out of the total production of the winter crop in the plains, the largest contribution is made by the United Provinces amounting to 21,750,000 maunds. Next in order of importance are Bihar and Bengal, which contribute 9,451,000 maunds and 6,781,800 maunds respectively. These three provinces together account for 86·5 per cent of the total produce of the winter crop in the plains. The remaining 13·5 per cent is produced in other provinces and States of which the important ones are Bombay, Assam and the Punjab.

The summer crop in the plains is mainly grown in Bombay, the Punjab and Mysore State which together contribute 90·6 per cent of the total supplies from this crop, Bombay accounting for 55·8 per cent, Punjab 15·7 per cent and the Mysore State 19·1 per cent. The other areas producing appreciable quantities of potatoes in summer are Sind and the North-West Frontier Province.

Out of the total production of 3,389,200 maunds of the summer crop in the hills, the largest share is that of Madras with 1,089,000 maunds. Next in order of importance are the United Provinces, Assam and North-West Frontier Province, which contribute 861,400, 616,000 and 320,000 maunds respectively. These four provinces together account for 85·1 per cent of the total production of the summer crop in the hills. The remaining 14·9 per cent is made up by other provinces and States of which the important ones are Patiala, the Punjab and Bengal. As regards the production of winter crop in hills, a large quantity is produced in the Nilgiri area (Madras Presidency), the produce of which in this season amounts to 335,400 maunds or 82·0 per cent of the total production of the winter crop in the hills in India. Bengal produces 28,000 maunds and all other provinces and States together produce about 46,000 maunds.

Taking the total annual production of potatoes of the plains and hills it is seen that the United Provinces top the list with 22,611,400 maunds or 46·1 per cent of the total. Bihar comes next with 9,451,000 maunds or 19·3 per cent. Bengal with its 6,865,800 maunds or 13·9 per cent is third in order of importance. Among the other provinces and States, Assam (4·2 per cent), Bombay (3·3 per cent), Punjab (3·2 per cent), Madras (2·9 per cent) and Mysore State (1·4 per cent) are more important.

In Burma, the total annual production is estimated at 1,740,300 maunds. The crop is mainly grown in summer in the hills.

### (3) ANNUAL VARIATIONS IN PRODUCTION.

Variations in the annual production are dependent upon the variations in acreage and yield. As has already been explained, the yield per acre is affected by several environmental factors such as diseases, pests, quality of seed, climate, cultural operations, etc.

No record is kept year by year of the average yields. Statistics of production are, therefore, not available. One can only judge from the acreage under potatoes in the past few years (1930-31 to 1938-39) and assume that the production has varied with the acreage and increased proportionately with the increase in area.

### D.—Seasons of harvesting and marketing.

Potatoes are normally grown as a winter crop in the plains and as a summer crop in the hills except in South India where the winter crop of the hills is also of considerable importance. The periods of planting and harvesting, however, vary from province to province as shown in Appendix III. The harvesting of the crop in the plains starts in December and continues till March. The produce also starts coming into the market at the same time and often continues till about June. From April onwards, however, the supplies in the plains are comparatively low. The supplies of the hill potatoes start from July-August and continue till the beginning of December, being at their maximum from the middle of September to the beginning of November. Thus we see that the period of meagre supplies is from June to August and again from November to about the middle of December. Conditions in different provinces are slightly different and it would be better to describe them separately.

*United Provinces.*—In the plains, harvesting begins in December and continues till April. The early sown crop is harvested in December, the mid-crop in February and the late crop mainly in March-April. In the hills, the crop in the valleys is harvested in June and July and at higher altitudes from September to early November. The period of marketing almost coincides with the period of harvesting. In a few cases, however, the produce may continue to come into the market in small quantities about a month or so after the harvest. June and July are the scarcity months all over the United Provinces. An approximate idea of the market supplies can be had from the following table which gives the proportion of the crop harvested each month in the United Provinces.

*Proportion of the crop harvested each month in the plains and hills.*

Month.	Hills.	Plains.
	Percentage of total area.	Percentage of total area.
June . . . . .	8	..
July . . . . .	20	..
August . . . . .	..	..
September . . . . .	20	..
October . . . . .	40	..
November . . . . .	8	2
December . . . . .	..	14
January . . . . .	..	..
February . . . . .	2	56.5
March . . . . .	2	23.5
April . . . . .	..	4
May . . . . .	..	..
	100	100

*Bihar.*—In Bihar, the harvesting of the early crop starts in November and of the main crop in December and continues till about the middle of March. The marketing season of the local produce continues till about June.

But the supplies from April onwards are comparatively small. The scarcity period is July and August. Thereafter, the supplies are received from the hills.

*Bengal.*—The harvest season in Bengal extends from November to March in the plains, and from July to the beginning of September in the hills. The produce of the hill crop is usually kept for seed and is sold during September and October. In the plains the marketing of the produce starts as soon as harvesting begins and the supplies continue to come to the market till June. By about July the local potatoes are out of stock except for seed purposes. The season of marketing of the seed starts in September and continues till November. An approximate idea about the market supplies can be had from the following table which gives the proportion of the crop harvested each month.

*Estimated percentage of potato crop harvested each month in Bengal.*

Month.	Approximate percentage.
July . . . . .	0.5
August . . . . .	0.5
September . . . . .	..
October . . . . .	..
November . . . . .	4
December . . . . .	7
January . . . . .	12.5
February . . . . .	54
March . . . . .	21
April . . . . .	0.5
May . . . . .	..
June . . . . .	..
	<hr/> 100 <hr/>

From the above table it is seen that about 87.5 per cent of the crop is harvested from January to March. The supplies are, therefore, most abundant in these months particularly in February and March. The market supplies begin to decrease in April and are very low in June and July. But imports from Burma begin towards the close of July and thus the market has appreciable quantities during August, September and October. In November, the imports of the Burmese produce decline, and the local produce is insufficient in spite of the commencement of the harvesting season. So the scarcity periods in Bengal are June-July and November-December.

*Assam.*—The main crop in the Khasi and Jaintia Hills is harvested from June to September. The marketing of the produce begins in July and continues till December. The supplies are heavy during August, September and October. This is substantiated by the export figures from Shillong—the chief assembling market for the hill potatoes—which are given in the following table:—

*Quantities of potatoes exported from Shillong each month in 1936.*

Month.	Quantity. (In maunds).
July . . . . .	31,483
August . . . . .	82,728
September . . . . .	100,834
October . . . . .	86,508
November . . . . .	40,626
December . . . . .	5,475

In the plains, the crop is harvested in December and January and the produce is ready for the market just after harvest. The supplies are greatest in January and February and by the end of April stocks are almost exhausted.

*Madras.*—The main summer crop is harvested from June to August and the winter crop in December and January. The monthly despatches of potatoes in 1936 from the Nilgiri Hills which is the main potato producing area in the Presidency are given below and clearly indicate the season of marketing.

*Quantities of potatoes exported each month from Nilgiri Hills.*

Month.	Quantities. (In maunds).
January . . . . .	43,166
February . . . . .	35,890
March . . . . .	21,974
April . . . . .	12,953
May . . . . .	19,688
June . . . . .	36,221
July . . . . .	111,361
August . . . . .	144,995
September . . . . .	110,370
October . . . . .	108,520
November . . . . .	72,460
December . . . . .	63,513
Total . . . . .	<u>781,111</u>

It will be seen that the period of maximum exports is from July to October when the monthly exports are more than a lakh maunds. The supplies are low from March to June.

*Punjab.*—The winter crop in the plains is harvested from the end of November to the end of February and the summer crop from middle of April to the end of May. The maximum supplies of the winter crop are received in the market from the middle of January to the middle of February and those of the summer from the beginning of May to the middle of June. From the end of July to the third week of November the supplies are at the lowest ebb, the produce of the plains being not available at all. The supplies are obtained from the neighbouring hill states and the North-West Frontier Province.

*Bombay.*—The planting seasons of potatoes in the different producing districts of the presidency differ on account of climatic differences and so do the seasons of harvesting and marketing. Two crops are raised in this province, one in the winter season and the other in the rainy season. The harvesting season of the former crop extends from January to the beginning of March and its produce continues to flow into the market till July, the supplies being at a maximum from March to May. The latter crop is harvested from September to October and is sent to the market immediately after the harvest because it does not keep well. June and July in summer and November and December in the winter season are the scarcity months for potatoes in the Bombay Presidency.

*North-West Frontier Province.*—The main summer crop in the hills is harvested in September and October. The season of marketing starts from the end of September and continues till December. In the plains the summer crop is harvested in May and June and the winter crop in December and January. The produce begins to flow into the market towards the close of the harvesting periods.



*Baluchistan.*—Early varieties are harvested in June and July and are available in the market till the end of September. The six-monthly variety matures in October and comes into the market in November.

*Mysore State.*—The winter crop is harvested in January and February and the rain crop in August and September. The produce of the former crop continues to flow into the market up to the beginning of May while that of the latter only for a short period after harvest, because of its poor keeping qualities. The supplies are meagre from June to August and again from November to December and are abundant from January to May and again from September to the end of November.

*Burma.*—In Burma, there are three crops, namely, the “summer”, the “rain” and the “winter” crops. Their harvesting seasons are May and June, August and September, and December and January respectively. The produce is sent out to the market soon after harvest. The monthly percentages of the annual traffic from Heho and Aungban railway stations, which accounts for 90 per cent of the total supply of the Shan States carried by rail are given in the following table. These figures give an approximate idea of the flow of supplies into the markets. (See also diagram facing page 19).

*Average total quantities consigned from Aungban and Heho stations during 1933-34 to 1935-36.*

Month.	Quantities. (Mds.)	Percentage of total annual traffic.
April . . . . .	299	..
May . . . . .	12,032	1.5
June . . . . .	48,700	6.0
July . . . . .	74,752	8.5
August . . . . .	188,131	22.0
September . . . . .	209,392	25.0
October . . . . .	200,327	24.0
November . . . . .	87,655	11.0
December . . . . .	11,134	1.5
January . . . . .	5,934	0.5
February . . . . .	299	..
March . . . . .	..	..

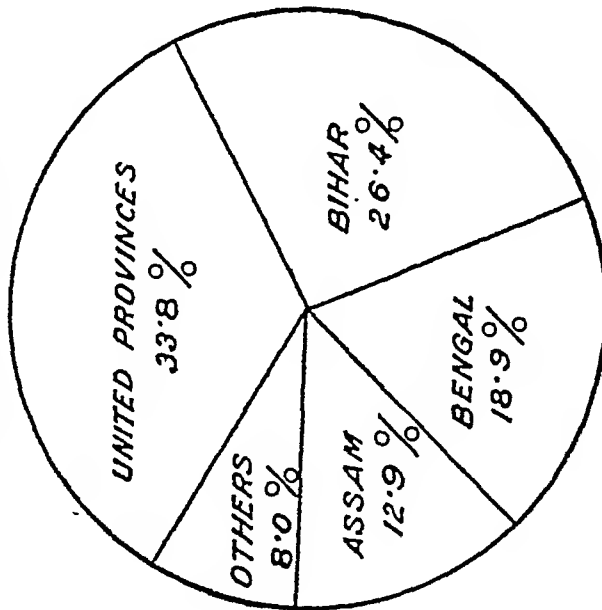
From this table it is evident that the traffic is very small from December to July. This is so because the produce of the “summer crop” and “winter crop” is small. With the harvesting of the “rain crop” in August and September, the traffic increases enormously in these two months. The supplies of this crop continue for another two months and so the fall in traffic in October and November is not very great. There is an enormous decrease in the traffic from December onwards. This is due to the very poor production of the “winter crop” which is harvested in December and January. The scarcity period for potatoes in Burma is from December to June.

#### **E.—Quantity retained by producers.**

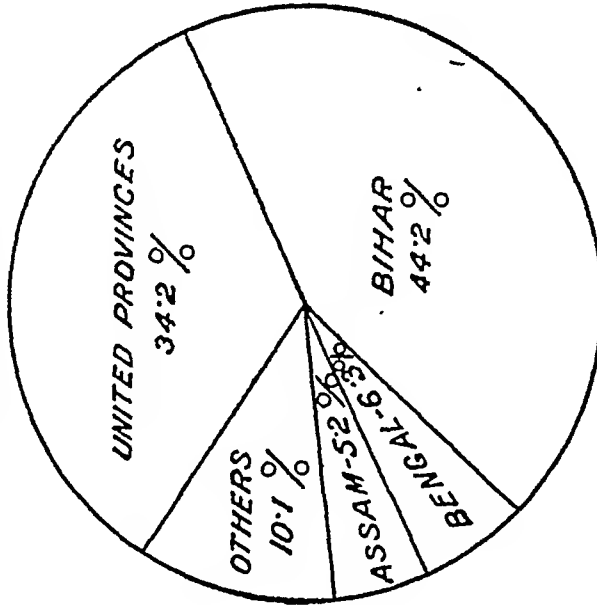
The proportion of the produce retained in the villages varies from province to province and within the same province from district to district and from one individual to another. The quantity retained depends on the size of the crop, the financial position of the cultivators and the conditions of

**TOTAL RETENTION OF POTATOES IN VILLAGES BY PRODUCERS FOR  
CONSUMPTION & SEED PURPOSES  
AND SHARES OF THE IMPORTANT PROVINCES IN EACH CASE.**

**FOR VILLAGE CONSUMPTION**



**FOR SEED PURPOSES**



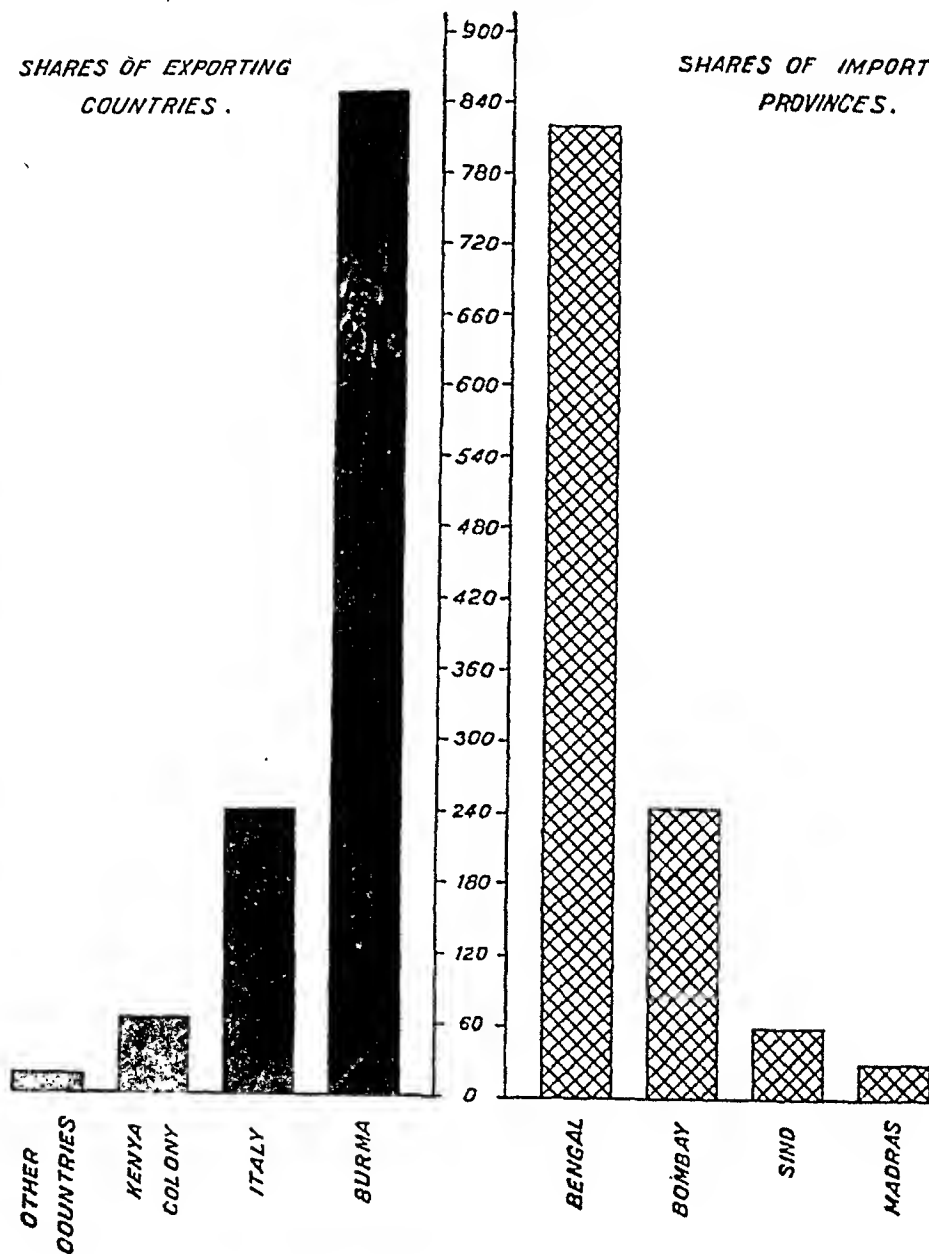
SHARES OF EXPORTING COUNTRIES & IMPORTING PROVINCES  
IN THE AVERAGE ANNUAL IMPORTS OF POTATOES  
INTO INDIA.

(1935-36 / 1938-39.)

THOUSAND MAUNDS.

SHARES OF EXPORTING  
COUNTRIES.

SHARES OF IMPORTING  
PROVINCES.



storage and the prices prevailing at the harvest time. When the holding is small, a higher proportion is retained for domestic consumption than when it is large. If the cultivator is in debt, he would dispose of the whole of the produce at once to meet his liabilities. He would retain only the cut, and damaged potatoes which his creditor or purchaser may reject. In these circumstances, any estimate of the quantities retained on the cultivators' holdings can at best be only a rough approximation.

Potatoes in the villages are retained for (1) domestic consumption and (2) seed purposes either for use on the holding or for subsequent sale as seed. The estimated quantities so retained in different provinces and States are given in Appendix IX (see also diagram facing page 24).

### (1) FOR DOMESTIC CONSUMPTION.

The total quantity of potatoes retained annually by the producers for domestic consumption in India amounts to 5,344,400 maunds or 10.9 per cent of the total production in the country. As is clear from Appendix IX the largest quantities are retained in the United Provinces (1,808,900 maunds). Next in order of importance are Bihar, Bengal and Assam with 1,408,200 maunds, 1,010,200 maunds and 688,300 maunds respectively. The retention of such relatively large quantities for domestic consumption in these provinces appears to be due to the small size of the holdings.

The retention of comparatively small quantities for domestic consumption in the Punjab, Sind, the Central Provinces, Bombay, Orissa and Hyderabad is probably due to the nearness of the main consuming markets where the produce can be readily sold.

In Burma, the quantity retained by the growers for domestic consumption is very small, amounting to 51,000 maunds or 2.9 per cent of the total production. A contributory factor in this case is the Burmese prejudice against eating potatoes.

### (2) FOR SEED PURPOSES.

Details of the quantities retained by the producers for seed purposes in different provinces and major States are given in Appendix IX. The total quantity so retained in India annually amounts to 7,932,200 maunds or 16.1 per cent of the total annual produce. Bihar is the most important province in this respect and accounts for 44.2 per cent of the total quantity retained for seed purposes. Next in order of importance is the United Provinces, accounting for 34.2 per cent of the total quantity retained for seed. These two provinces together account for 78.4 per cent of the total quantity retained for seed purposes in India. As has been stated already storage conditions play a very important part in the retention of the produce for seed purposes. In Bihar, Madras, Assam, Kashmir, Bengal, North-West Frontier Province, Bombay and the United Provinces where either the conditions for storing are favourable or the producers have acquired the necessary technique, fairly high proportions of the local produce namely 37.1 per cent, 24.2 per cent, 19.8 per cent, 12.6 per cent, 7.3 per cent, 18.5 per cent, 14.3 per cent and 12.0 per cent respectively are retained for seed purposes.

Very small quantities are retained in Sind (1,000 maunds), Central Provinces (1,700 maunds) and the Punjab (62,500 maunds). This is apparently due to the fact that the storage of seed on a large scale has not been developed in these areas. There are other provinces and States also such as Orissa,

Baroda and Hyderabad, where no attempt is made at storing potatoes for seed purposes. These provinces and States largely depend upon outside sources for their seed supply. The position in regard to seed supply of the different provinces and States is dealt with in detail in the Chapter on "Seed".

In Burma, the total quantity of potatoes retained by the growers for seed purposes amounts to 255,000 maunds a year. This represents 14·7 per cent of the total production. The percentage is high because the seed requirements are met entirely out of the home grown produce.

### (3) TOTAL QUANTITY RETAINED.

The total quantity retained by the producers in the country as a whole both for domestic consumption and for seed purposes amounts to 13,276,600 maunds or 27·0 per cent of the total production. Bihar alone retains 4,914,500 maunds or 37·0 per cent of the total. Next in order of importance are the United Provinces, Bengal and Assam accounting for 34·1, 11·4 and 8·3 per cent respectively of the total quantity retained.

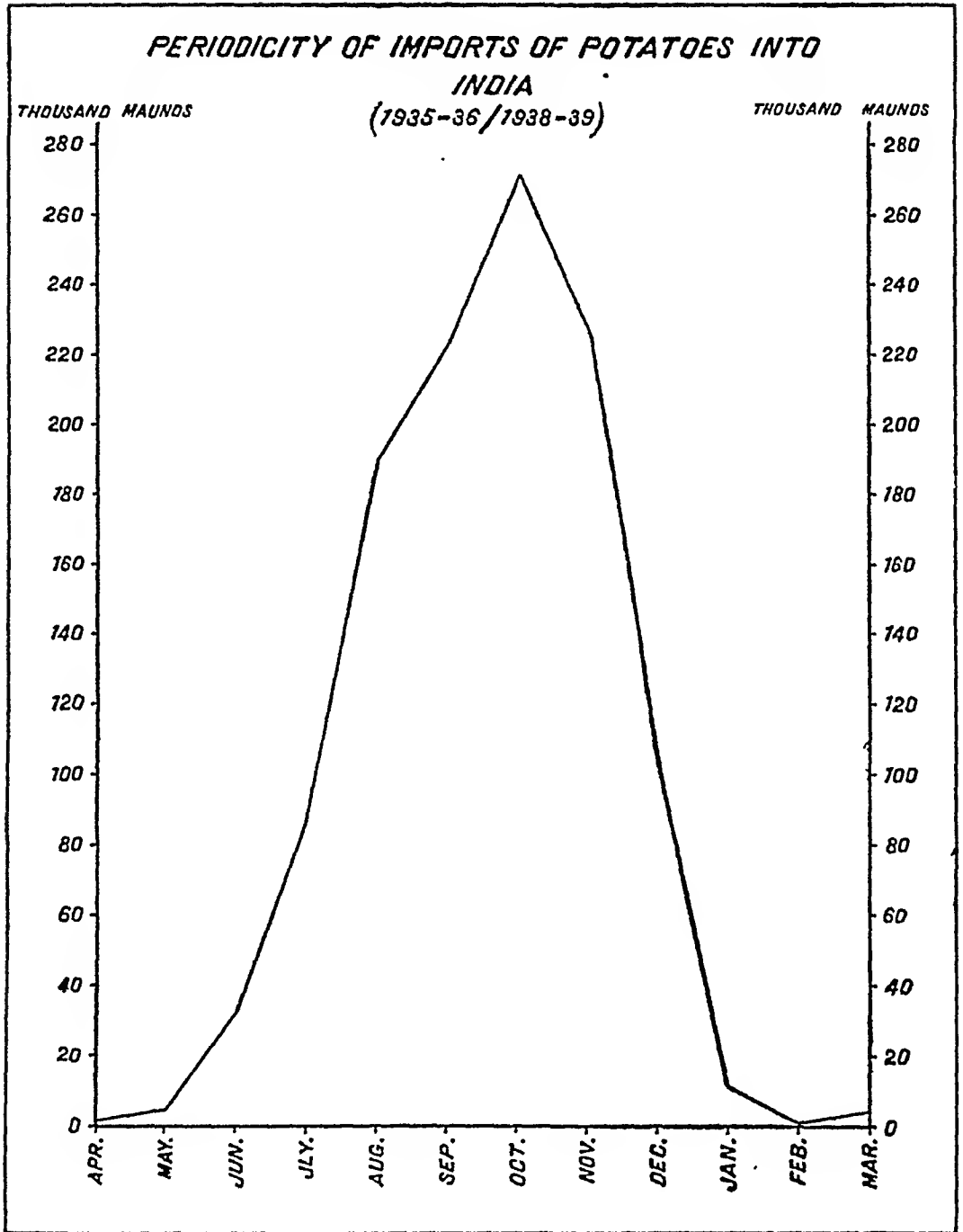
The proportion of the quantity retained to the local production is different in different provinces. Assam, for instance, retains the largest proportion of the produce, *viz.*, 52·6 per cent. Next in importance are Bihar, Madras, North-West Frontier Province, Bengal, United Provinces and Bombay retaining respectively 52·0 per cent, 32·3 per cent, 31·9 per cent, 22·0 per cent, 20·0 per cent and 17·8 per cent of the produce in the respective areas. In other provinces and States the growers retain only a small proportion of their produce.

In Burma, the total quantities retained both for seed and domestic consumption by the growers amount to 306,000 maunds or 17·6 per cent of the total home produce.

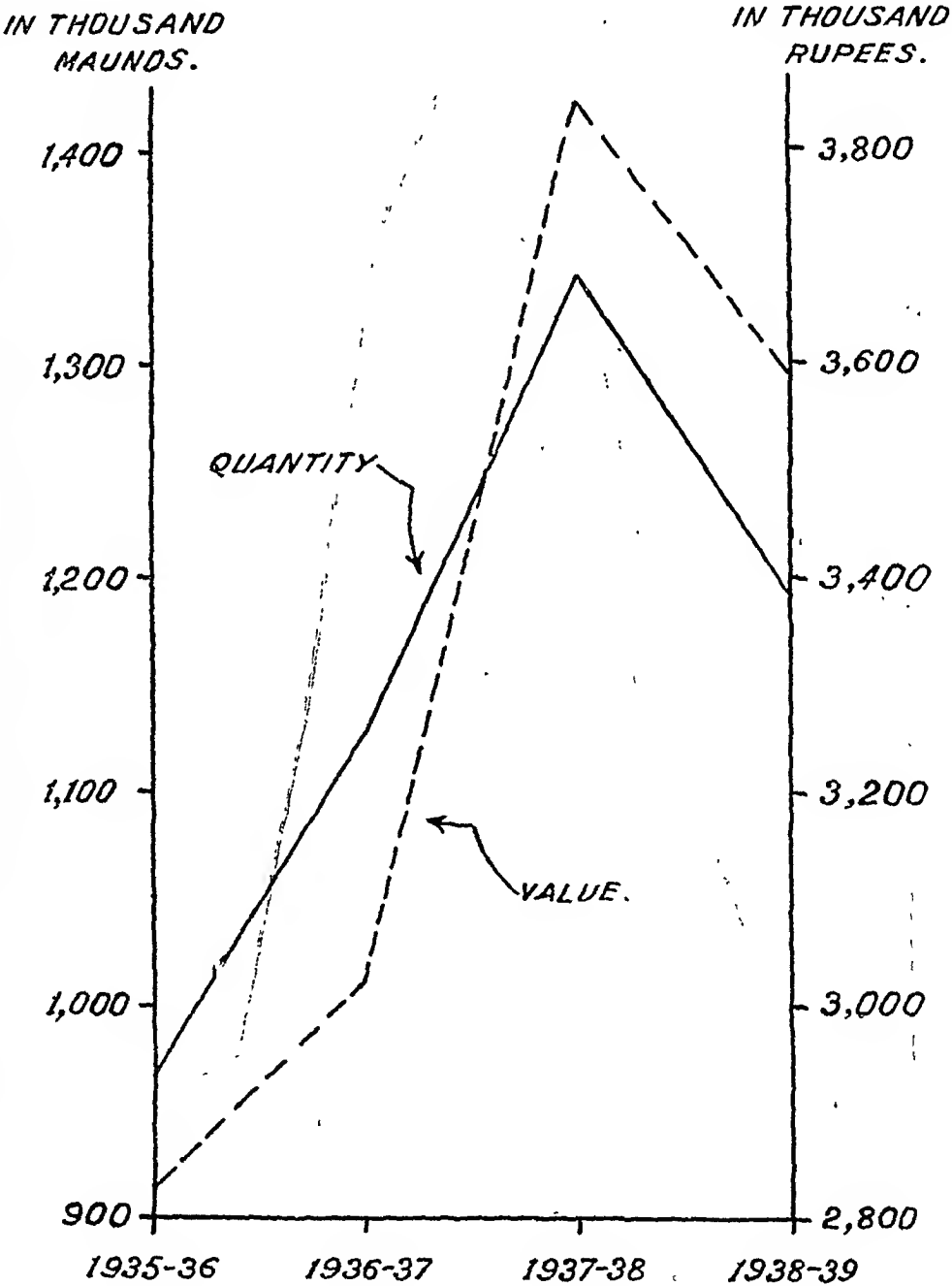
### F.—Supplies of Indian produce available for the market as eating potatoes.

The total production of the country less the quantities retained by the growers for domestic consumption and for seed gives the net available supply of table potatoes put on the market.

	(1) INDIA.	
	Quantity. Mds.	Value. Rs.
1. Total production . . . . .	49,103,000	9,51,82,000
2. Quantity retained for—		
(a) Village consumption . . . . .	5,344,400	
(b) Seed . . . . .	7,932,200	
Total, say . . . . .	13,277,000	2,72,58,000
Net available supply for the market as eating potatoes	35,826,000	6,79,24,000
(2) BURMA.		
1. Total production . . . . .	1,740,000	51,90,000
2. Quantity retained for—		
(a) Village consumption . . . . .	51,000	
(b) Seed . . . . .	255,000	
Total . . . . .	306,000	9,10,000
Net available supply for the market as eating potatoes	1,434,000	42,80,000



TREND OF IMPORTS OF POTATOES INTO  
INDIA FROM FOREIGN COUNTRIES.  
(1935-36/1938-39)



Thus out of the home grown potatoes, the net available supplies of table potatoes for the market amount to 35,826,000 maunds valued at Rs. 6,79,24,000 in India and 1,434,000 maunds valued at Rs. 42,80,000 in Burma.

### G.—Imports.

#### (1) SOURCES, QUANTITIES AND VALUES.

Potatoes are imported mainly from Burma, Italy and Kenya Colony. Other sources of minor importance are the United Kingdom, Netherlands, Japan, the Union of South Africa, etc. Imports from Burma are received mainly at Calcutta and to a small extent at Madras, Coconada, Vizagapatam and Puri ; from Italy at Bombay and Karachi and from Kenya Colony mainly at Bombay.

The quantities and value of potatoes imported into India from different countries and the shares of different provinces for the period 1935-36 to 1938-39 are given in Appendix X to X(d). The average quantities and the value of annual imports from each of the important countries and the share of each province for the same period are given below. (See also diagram facing page 25).

#### *Average imports of potatoes into India from different countries (1935-36 to 1938-39).*

Country.	Quantity.	Value.
	Maunds.	Rs.
Burma . . . . .	849,475	18,78,294
Italy . . . . .	225,951	11,01,509
Kenya Colony . . . . .	64,093	2,68,274
United Kingdom . . . . .	468	2,849
Netherlands . . . . .	266	1,321
Union of South Africa . . . . .	49	179
Others . . . . .	15,436	66,280
Total . . . . .	1,155,738	33,18,706

#### *Share of certain provinces in average annual imports (1935-36 to 1938-39).*

Province.	Quantity.	Value.
	Maunds.	Rs.
Bengal . . . . .	819,775	17,75,822
Bombay . . . . .	244,287	12,16,302
Madras . . . . .	31,524	1,09,317
Sind . . . . .	60,152	2,17,265
Total . . . . .	1,155,738	33,18,706



The average annual quantity imported into India is a little over 11½ lakh maunds and constitutes 2·4 per cent of the total average annual supply of the country. The largest quantities are imported from Burma and amount to 73·5 per cent of the total imports. Next in order of importance are Italy and Kenya Colony, the imports from each country being 19·6 per cent and 5·5 per cent of the total respectively.

The imports from Burma are largely used for table purposes, only about 50,000 maunds being used annually for seed, mainly in Bengal.

Italian potatoes are largely used for seed purposes. About 65 per cent of the imports at Bombay and more than 50 per cent of the imports at Karachi are used for seed purposes and the rest for table consumption. 98 per cent of the imports from Kenya Colony are used for table purposes. The imports from other countries are exclusively used for consumption or for experimental purposes.

Imports into Burma are negligible. Sometimes small quantities are imported from India or other countries for trial purposes.

## (2) PERIODICITY.

The diagram facing page 26 illustrates the periodicity of imports of potatoes into India from different countries.

The average monthly quantities of imports from different countries for the period 1935-36 to 1938-39 are given below :—

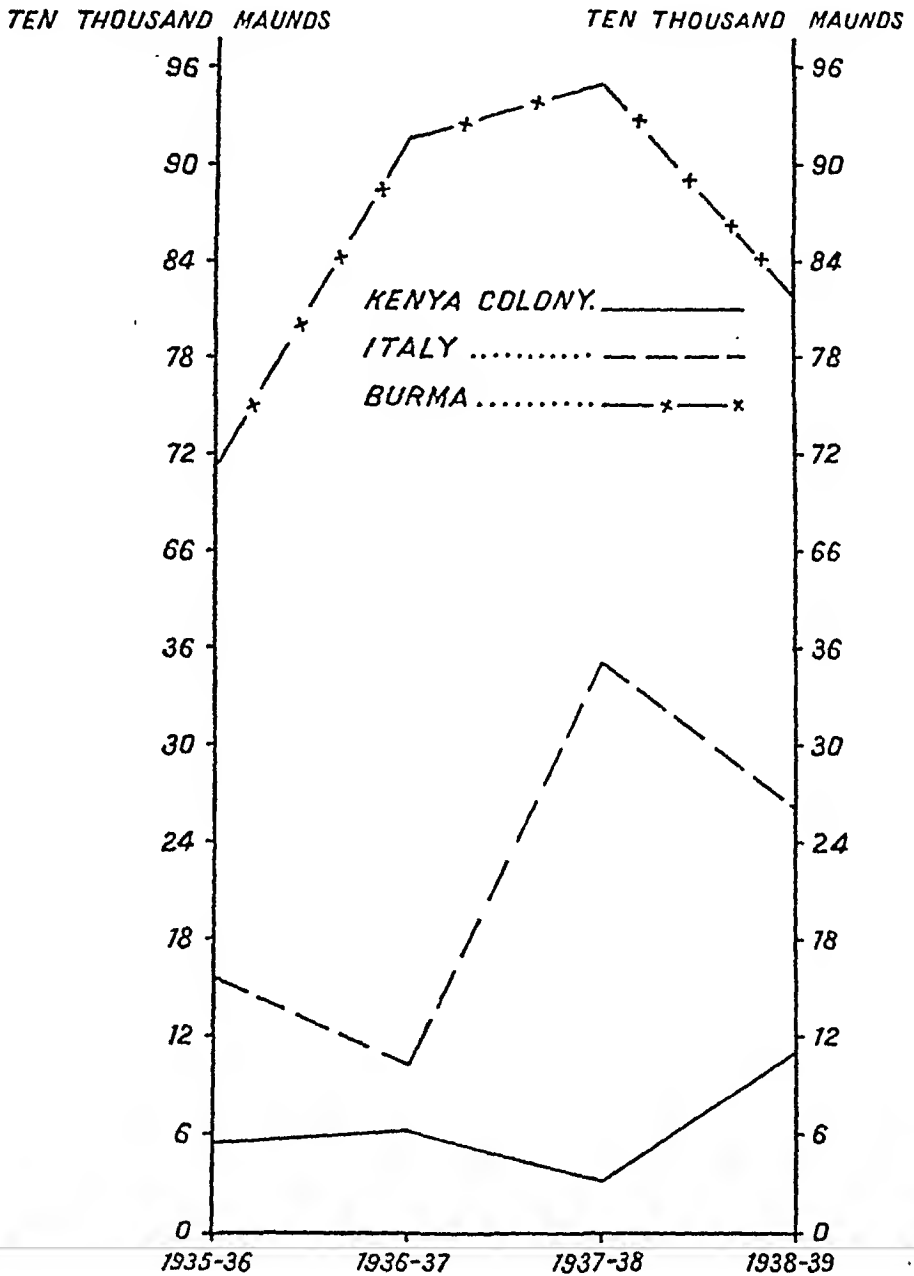
*Average monthly imports into India during the period 1935-36 to 1938-39.*

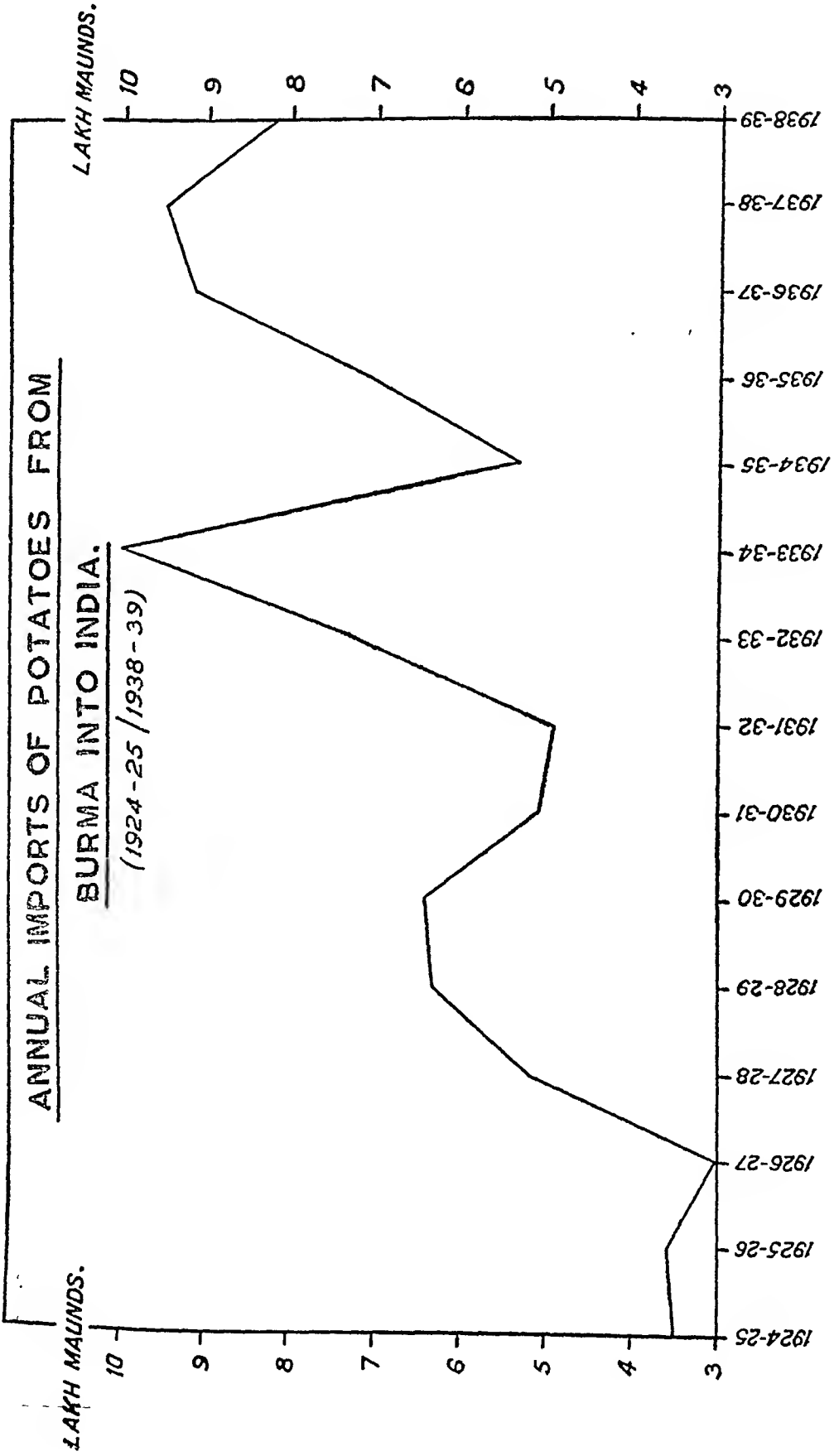
(In maunds).

Months.	Kenya Colony.	Burma.	Italy.	Others.	Total.
April . . . . .	359	1,097	..	..	1,456
May . . . . .	72	4,513	..	9	4,594
June . . . . .	1,295	27,966	2,870	2	32,133
July . . . . .	4,973	58,485	22,183	1,542	87,183
August . . . . .	9,581	139,967	33,448	6,880	189,876
September . . . . .	11,909	165,464	41,976	3,811	223,160
October . . . . .	12,961	205,870	50,353	2,259	271,443
November . . . . .	14,239	156,267	53,928	938	225,472
December . . . . .	6,616	79,432	18,098	388	104,534
January . . . . .	839	7,016	3,095	387	11,337
February . . . . .	260	360	..	..	620
March . . . . .	989	2,938	..	3	3,930
Total . . . . .	64,093	849,475	225,951	16,219	1,155,738

ANNUAL IMPORTS OF POTATOES INTO INDIA  
FROM FOREIGN COUNTRIES.

(1935-36 to 1938-39)





From the figures on preceding page it is seen that the period of heavy imports from all the countries is from July to December when local supplies in India are lowest. From January to June, when the local supplies are in abundance, imports are small. It so happens that the potato season in the exporting countries, viz., Burma, Italy and Kenya Colony, starts when the local supplies in India are falling off. Thus the imports have not got to face any serious competition from the local produce. The rain crop which is available in this season in the plains in the Bombay Presidency and the Mysore State is generally regarded as inferior in quality to the imported produce. The produce of the hill crop is, however, superior. But this is not available in sufficiently large quantities to meet the demand.

India imports annually about 11.6 lakh maunds of potatoes. Of this quantity Bengal gets about 8.2 lakh maunds, Bombay 2.4 lakh maunds and Sind a little over 60 thousand maunds. The local supplies are obviously insufficient mainly in the above mentioned provinces. As the imports cost the country about Rs. 33,18,700 every year, it is worth while trying to make up the deficiency.

In India, potatoes cannot, however, be successfully grown in the plains during summer. A possible solution of the problem would be to store the surplus produce of the main crop in the plains in cold stores and release it during the scarcity period. The prices of potatoes during March and April in the main producing centres range from Rs. 1-4-0 to Rs. 2 per maund while during the period July to November from Rs. 3 to Rs. 5-8-0 per maund. There is a fairly big difference in the prices of the two seasons. Storage would seem, therefore, to be a commercial possibility since it would apparently pay to store a portion of the supplies in March-April to be released for the market in July-November when supplies are low.

An alternative to cold storage is to produce greater quantities in the hills. Bengal imports very large quantities from abroad. It, however, also receives a part of its supplies from Khasi and Jaintia, Kumaon, Simla and Nilgiri Hills. The possibilities of increasing production in these hills deserve careful consideration. The main difficulty is apparently the cost of transport which prior to September 1939 was only Re. 0-12-4 per maund from Aungban (producing area in Burma) to Calcutta, but approximately Rs. 1-4-0 and Rs. 1-3-0 per maund respectively from Shillong (assembling market for the produce in Khasi and Jaintia Hills) and Simla to Calcutta.

In the Bombay Presidency there are no suitable hill areas except Mahabaleshwar where potatoes are being grown to a small extent. But the scope for further extension of the area under potatoes in this place seems rather limited. It may, however, be possible to increase the area under the rain crop in the Poona and Satara districts.

Bombay imports potatoes mainly from Italy and Kenya Colony. The imports from the latter place are used for table purposes and could be dispensed with if local supplies were sufficiently increased. It is, however, different in the case of imports from Italy, which are mostly used as seed. It is reported that the Italian potatoes deteriorate in the course of a few years under Indian conditions and so fresh supplies of seed have to be obtained to renew the stock. Alternative arrangement for seed supply would, therefore, have to be made in this country in view of such imports. On account of the frequent occurrence of frost, Bombay requires a frost resisting variety having short duration and good table qualities to replace the Italian varieties. The *Surkha* (*Darjeeling Red*) variety which can be obtained from Patna matures in about 90 days and is usually ready before the frost occurs. This

might prove suitable for Bombay conditions. The *Gola* type which gives a crop in about 65-75 days might also do well in Bombay Presidency.

The case of Sind is not very different from that of Bombay. There are no suitable hills in Sind where potatoes could be grown in summer and so it has to depend for its supplies on foreign countries. As regards seed, unless some new varieties which could replace the Italian variety are introduced, the imports will have to be obtained from Italy. Trials should, therefore, be made with the *Gola* type. Alternatively, the exchange of seed with Baluchistan should be organised. (For details see Chapter on "Seed").

Ordinarily Madras does not import potatoes from abroad except small quantities from Burma mainly into the markets in the north of the presidency when the Nilgiri crop is poor.

### (3) TREND.

For studying the trend of imports into India it is necessary to have statistical data for a number of years but unfortunately such statistics are not available except in the case of imports from Burma. The figures of imports of potatoes from other countries are available for the period 1935-36 to 1938-39 only. The annual total imports of potatoes into India during this period are shown in the following table (see also diagrams facing pages 27 and 28):—

#### *Annual imports of potatoes into India.*

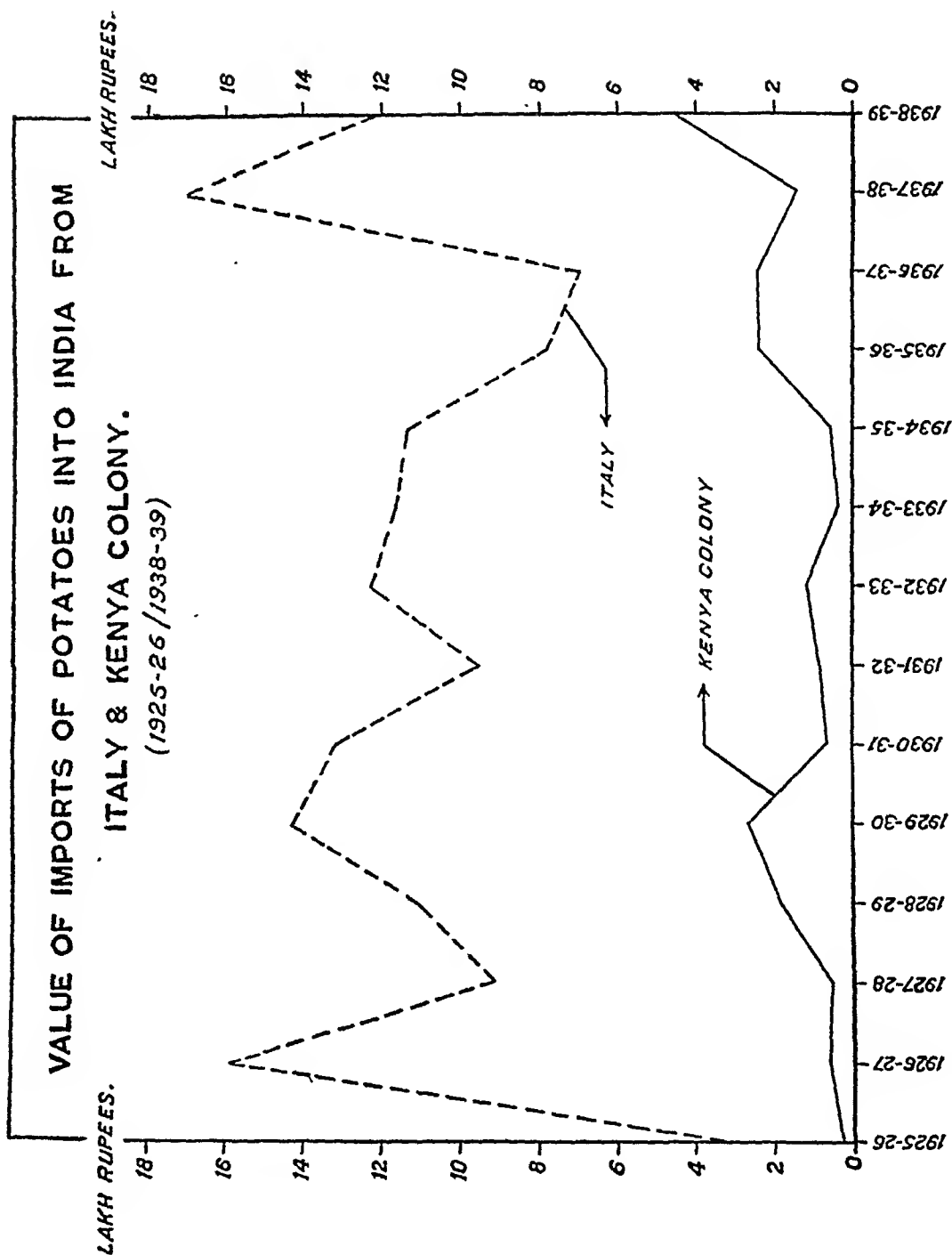
Year.	Quantity. (Maunds.)
1935-36 . . . . .	967,549
1936-37 . . . . .	1,126,141
1937-38 . . . . .	1,336,242
1938-39 . . . . .	1,193,020

The above figures show a gradual increase during the three years 1935-36 to 1937-38, the total increase being  $3\frac{1}{2}$  lakh maunds. In 1938-39, there was a fall of about a little less than one and a half lakh maunds. This was mainly due to a reduction in the imports from Burma and Italy. The trend of imports of potatoes from Burma, Italy and Kenya Colony from which the bulk of imported supply is drawn is discussed below individually.

The annual imports from Burma for the last fifteen years are shown in the following table and are also represented diagrammatically in the graph facing page 29.

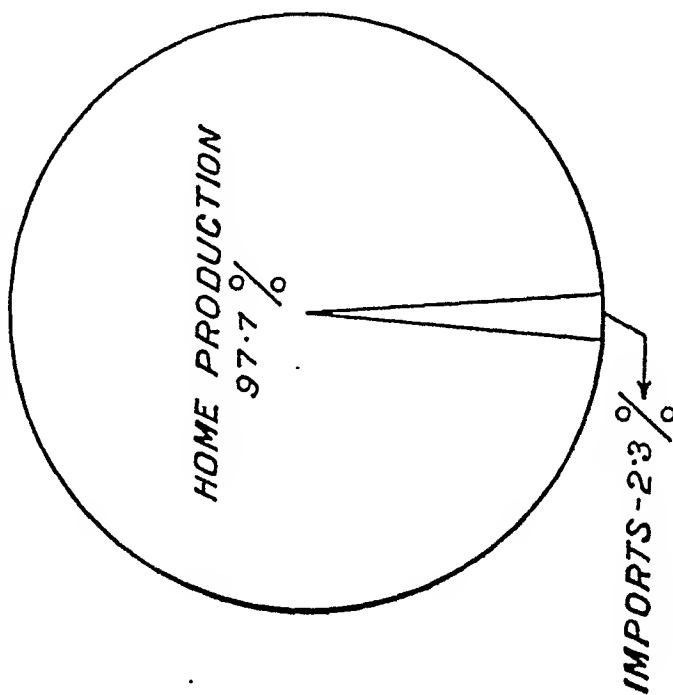
#### *Annual imports from Burma into India.*

Year.	Quantity. (Maunds.)
1924-25 . . . . .	351,710
1925-26 . . . . .	359,249
1926-27 . . . . .	302,931
1927-28 . . . . .	519,929
1928-29 . . . . .	631,830
1929-30 . . . . .	641,602
1930-31 . . . . .	513,260
1931-32 . . . . .	495,648
1932-33 . . . . .	730,094
1933-34 . . . . .	1,002,267
1934-35 . . . . .	535,607
1935-36 . . . . .	711,579
1936-37 . . . . .	917,190
1937-38 . . . . .	950,190
1938-39 . . . . .	818,940

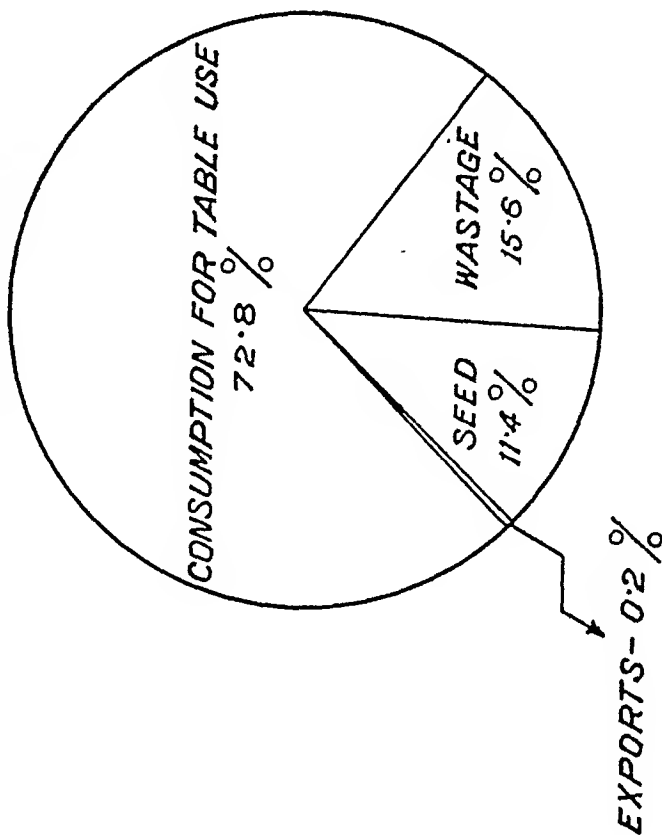


# SUPPLIES & UTILIZATION OF POTATOES IN INDIA .

## SUPPLIES



## UTILIZATION



It will be seen that imports in 1924-25 were 351,710 maunds whereas in 1938-39 they amounted to 818,940 maunds which shows an increase of 133 per cent. There have, however, been considerable fluctuations during this period. From 1927-28 to 1931-32 the imports have ranged between 5 and 6 lakh maunds; in 1933-34 they increased to 1,002,267 maunds and in the succeeding year they decreased to 535,607 maunds. In 1935-36 and 1936-37, the supply increased again and in the latter year the quantity imported amounted to 917,190 maunds. In 1937-38, imports rose to 950,190 maunds, but in the following year there was a decline in imports and these stood at 818,940 maunds. The fluctuation has been mainly due to increase or decrease in Burma production.

Figures of imports of potatoes from Italy and Kenya Colony for a number of years are not available. The annual statement of Seaborne Trade of India gives the values of imports of fresh vegetables from different countries. On enquiries being made from importers it was found that the imports from the above two countries consisted mainly of potatoes. Their values for the period 1925-26 to 1938-39 are given in Appendix XI and are also illustrated by the diagram facing page 30. From these figures it is seen that the imports from Italy show a considerable variation from year to year. This may partly be due to fluctuation in the price of potatoes in Italy. The considerable fall in the imports from Italy in the year 1936-37 was due to the Abyssinian War. In 1937-38, that is, after the conclusion of the war, the imports rose enormously as large quantities were purchased by the growers who had not been able to renew their stocks in the previous two years. The imports in that year beat all records of the past 15 years. In 1938-39, there was a slight fall due perhaps to the heavy purchases made by the cultivators in the previous year.

The imports from Kenya Colony during the past 15 years have increased steadily. In 1925-26 they were valued at Rs. 25,929 and in 1938-39 at Rs. 4,54,412.

## H.—Exports.

### (1) DESTINATIONS, QUANTITIES AND VALUES.

The exports from India consist mainly of the produce of Mysore, Madras, Bombay and Sind, and the principal destinations are Ceylon, Bahrein Island, Iraq and Muskat Territory.

The exports from Mysore, Bombay and Sind are exclusively of the *Italian White Round* variety and from Madras of the *Great Scot* variety. It has been reported that the Ceylon demand is mainly for round potatoes. This might perhaps be due to the public having become used to round types of potatoes, of which they get very large quantities from Japan and Italy. The exports to Bahrein Island, Iraq, etc., are made mainly from Bombay and Sind and are entirely made up of the *Italian White Round* type.

The annual quantities of potatoes exported from India amount to approximately 93,892 maunds valued at Rs. 2,81,300. Out of this quantity Ceylon gets 73,038 maunds valued at Rs. 2,19,116. The table below shows the



quantities of potatoes exported to Ceylon and other places from different potato producing areas :—

*Annual estimated exports of potatoes from different potato producing areas.*

Exporting provinces and States.	Ceylon.		Others.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Maunds.	Rs.	Maunds.	Rs.	Maunds.	Rs.
Mysore State .	41,053	1,23,159	..	..	41,053	1,23,159
Madras . .	29,119	87,357	20	70	29,139	87,427
Bombay . .	1,866	5,600	13,134	38,905	15,000	44,505
Sind . .	1,000	3,000	7,580	22,740	8,580	25,740
Bengal . .	..	..	120	469	120	469
Total .	73,038	2,19,116	20,854	62,184	93,892	2,81,300

It is seen from the above table that the exports from Mysore and Madras are entirely to Ceylon except for small quantities from Madras which may be exported now and then to Burma for trial purposes. From Bombay and Sind only small quantities of potatoes are sent to Ceylon as they have a better market in Iraq, Bahrein Island and Muskat Territory. The quantities exported are not very large owing to the great demand for the produce within the country. There are quite good prospects of increasing the export trade if the production could be increased. But the main difficulty in this connection is the high cost of seed and of transport.

## (2) PERIODICITY.

Small quantities of potatoes are exported throughout the year. The bulk of the export is, however, made from January to June. Potatoes are exported from Madras mainly during January and February and from Mysore and Sind mainly from March to May. Bombay exports small quantities throughout the year but the largest exports are made in May and June, the quantities being 2,912 and 1,784 maunds respectively. In other months, small quantities are exported, usually ranging between 77 maunds and 374 maunds.

## (3) TREND.

Figures of export of potatoes from India for a number of years in the past are not available. However, enquiries made from exporters and others concerned in the business show that exports from Sind in particular have gone down to a great extent in the past few years. The exports from Sind to Ceylon before 1935-36 were stated to be from 10 to 15 thousand maunds per annum, but at present they have come down to 800 to 1,000 maunds. In the year 1936-37 there were no exports to Ceylon. Similarly exports to Iraq and Muskat have come down from 20 to 25 thousand maunds to 2 to 3 thousand maunds. The main reason for this is a fall in acreage under

potatoes in the province owing, it is said, to irrigation difficulties in the producing areas. The exports from Bombay Presidency decreased from about 15,000 maunds in 1936-37 to 7,254 maunds in 1938-39. In 1937-38 only 2,056 maunds were exported. The exports from Mysore State and the Madras Presidency have gradually increased on account of an increasing demand for the produce from these sources in the Ceylon market.

Burma exports potatoes mainly to India and the trend of Burmes exports has already been discussed under Indian imports.

### I.—Total and net available market supply.

#### (1) INDIA.

	Quantity.	Value.
	Mds.	Rs.
1. Production . . . . .	49,103,000	9,51,82,000
2. Quantities retained for—		
	Mds.	
(a) Consumption . . . . .	5,344,400	
(b) Seed . . . . .	7,932,200	
Total, say . . . . .	13,277,000	2,72,58,000
3. Net available supply of home produce for table purposes . . . . .	35,826,000	6,79,24,000
4. Imports * . . . . .	1,156,000	33,19,000
5. Deduct—Exports . . . . .	94,000	2,81,000
6. Balance available . . . . .	36,888,000	7,09,62,000

#### (2) BURMA.

	Quantity.	Value.
	Mds.	Rs.
1. Quantities produced . . . . .	1,740,000	51,90,000
2. Quantities retained for—		
	Mds.	
(a) Consumption . . . . .	51,000	
(b) Seed . . . . .	255,000	
	306,000	9,10,000
3. Net available home produce . . . . .	1,434,000	42,80,000
4. Imports . . . . .	140	500
5. Exports . . . . .	850,000	27,02,000
6. Total net available . . . . .	584,000	15,78,000

\* Estimated to include 1 1/3 lakh maunds used as seed. .

It is seen from the table on preceding page that the net available supplies of potatoes in India amount to 36,888,000 maunds valued at Rs. 7,09,62,000. Out of this, 1,156,000 maunds valued at Rs. 33,19,000 are derived from foreign countries in which the shares of Burma, Italy and Kenya Colony amount to 73·5 per cent, 19·6 per cent and 5·5 per cent respectively.

**Burma.**—The market supplies in Burma are entirely derived from local production. The imports are negligible. Out of the total home production of 1,740,000 maunds, valued at Rs. 51,90,000, 48·9 per cent or 850,000 maunds valued at Rs. 27,02,000 are exported annually to foreign markets, mainly to India.

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## INTER-CHAPTER ONE.

The potato (*Solanum tuberosum*) is called by various Indian names such as *alu*, *bilaiti alu*, *batata*, *urulai*, *kilangu* and *urula gudda* and is cultivated more or less in all parts of the country. A century ago it was comparatively unknown in India, but today it is probably the most widely grown of all the vegetables. It is an important money crop being worth about nine and a half crores of rupees. The share of India both in world acreage and production is very small being less than one per cent in each case. The annual imports into India are, however, considerable and average in recent years about 11½ lakh maunds valued at over Rs. 33 lakhs.

Statistics regarding the acreage under potatoes are not generally maintained. In view of the commercial importance of the potato crop it seems desirable that provinces and States should maintain records of area and production so that the exact position of home supplies may be ascertained from year to year. Such returns, however, need only be called for from those districts where potatoes are known to be grown for sale.

The total area under potatoes in India during the five years ending 1939, is estimated at 448,700 acres, of which about 90 per cent are estimated to be grown in the plains (including the Deccan) and the remainder in the hills. Generally two crops—one in winter and the other in summer—are raised in the plains and sub-montane tracts. The winter crop is by far the more important and represents 95 per cent of the total potato area in the plains. Conversely, about 87 per cent of the potatoes in the hills are produced in summer. The planting of the winter crop in the plains usually begins in September and continues till about the middle of December. For the summer crop, planting usually begins by about February. In the hills, the planting of the summer crop is usually done during February, March and April and that of the winter crop in August and September.

The main areas of concentrated production lie in the north. United Provinces, Bihar, Bengal and Assam, for example, account for more than 80 per cent of the acreage. In Bombay, the main area of production is in the Poona district. Elsewhere in the South, the production of potatoes is mainly confined to the Nilgiri Hills and to a small extent to the plateau of Mysore, mostly in the Bangalore district. The United Provinces has

the largest area under potato cultivation (161,800 acres) which constitutes 36·1 per cent of the total area. Next in order of importance are Bihar, Bengal, Assam, Bombay, Madras and the Punjab with 90,000, 77,400, 31,500, 22,500, 14,200 and 11,600 acres respectively. Among the States, Mysore tops the list with 5,700 acres.

There is an upward trend in the acreage. According to the available figures, although there has been a decrease in some parts, there has been a general increase of 49,400 acres equal to about 11·8 per cent since 1930-31 in the country as a whole. In Bengal, the acreage has gradually increased from 60,500 in 1930-31 to 88,000 acres in 1938-39. In Bombay, during the last 25 years or so, the area under this crop has increased considerably. In the Poona district, for instance, the area increased from 6,026 acres in 1914-15 to 16,993 acres in 1938-39. In Madras Presidency, the area under potatoes fluctuated between 8,111 and 8,664 acres during 1923 to 1929 and thereafter it started increasing. In the Punjab, the province as a whole has recorded an increase of over 20 per cent from 1930-31 to 1934-35, mainly in the neighbourhood of Ferozepur, Lyallpur, Ludhiana, Amritsar and Jullundur.

Most of the varieties commonly grown in India have been imported in the past from Europe and North America. The so called *desi* varieties are also considered to be imported varieties which have become acclimatised and of which the original names have been lost. There is a great confusion in nomenclature and no uniform system exists for naming the varieties. The most common convention adopted is to name a variety after the locality in which it has been grown for some time, e.g., *Jullunduri*, *Farrukhabadi*, *Dharwar*, *Pahari* (hill potato) and *Kangra Local* (a local potato of Kangra). Another common practice is to designate a variety by one or more of its most noticeable attributes ; *Phulwa*, a variety which flowers, *Lalwa* (red skinned), *Sufeda* (white skinned), *Gola* (round), *Khera* (long like cucumber) and *Sufed Gola* (white round), are some examples of this kind of nomenclature. Sometimes a name may indicate both the locality as well as the outstanding feature of the variety. Examples of this are *Patna Sufeda* (white potato from Patna), *Farrukhabad Phulwa* (a flowering variety from Farrukhabad) and *Dehra Dun Gola* (round potato from Dehra Dun).

Very often the same variety is designated by a number of different names, and conversely different varieties may be designated by the same name. From the marketing point of view, particularly in the matter of grading, and from the point

of view of production so far as seed is concerned, it is necessary that all doubts about the identity of the different varieties of potatoes should be cleared up. The present trade classification differs from place to place and cannot be relied upon with the result that personal inspection of the produce before purchasing is necessary in nearly every case.

From the general trade point of view, all the commercial varieties of potatoes grown in India can be classified as "White" or "Coloured" and "Round" or "Oval". Among the *desi* varieties there are three important groups, namely, *White Round*, *Coloured Round* and *Coloured Oval*. Potatoes falling into the group of *White Round* can further be classified as *Phulwa* type and *Gola* type. The main difference between the *Gola* and the *Phulwa* type of potatoes is that the tubers in the former case are not perfectly round and that they have deep eyes with long prominent eye-brows and the crop is ready in 65 to 75 days as against  $3\frac{1}{2}$  to 5 months in the case of the *Phulwa* type.

The *desi* varieties are cultivated mainly in the plains and appear to owe their popularity to their ability to withstand heat and drought and are apparently also resistant to some extent to the diseases which are common in the plains. Almost all the European varieties grown in this country on a commercial scale have white tubers and according to shape can be classified as either round or oval.

From a preliminary study it has been determined that while quite a large number of varieties (probably about 30) are grown in different parts of India to a greater or lesser extent, the varieties of actual importance from the commercial point of view are relatively few and their number probably does not exceed eight. Four of them *viz.*, *Phulwa*, *Gola*, *Italian White Round* and *Darjeeling Red Round* are mainly grown in the plains. *Magnum Bonum*, *Up-to-date*, *Royal Kidney* and *Great Scot*—along with *Darjeeling Red Round*—constitute the main part of the crop grown in the hills.

Unlike other crops (wheat, rice, linseed, etc.), there are no official records or estimates of the yield of potatoes. It is, therefore, difficult to get an accurate idea of the production in different centres. In view of the money value of the crop, it seems desirable that yield determinations should be made regularly on the lines of the crop lifting experiments carried out in the case of other crops.

As a result of extensive enquiries, it has been calculated that the weighted average yield per acre for the whole of India is 109 maunds. The largest yield per acre in the case of winter crop in the plains runs as high as 200 maunds in Kashmir, 150 maunds in the Punjab and 145 maunds in the United Provinces or it may be as low as 40 maunds in Gwalior, 65 maunds in Orissa and Patiala or 67 maunds in Assam. The yield of the summer crop varies from 60 maunds in Bombay and Sind to 140 maunds in Kashmir. According to these figures, the highest yields are obtained from the winter crop in the plains. In the case of the hill crop, the yields are higher in summer than in winter. The summer yields in the hills may be as high as 150 maunds per acre in Patiala, 110 maunds in the Nilgiris or 100 maunds in the North-West Frontier Province and the Punjab and as low as 23 maunds in the winter season in Assam.

In other countries of the world, Belgium tops the list with an yield of 224 maunds per acre. The comparatively poor yield in India is mainly attributed to a relatively low standard of cultivation and to the fact that growers do not attach sufficient importance to the quality of the seed used. Further, it is only in recent years and in certain parts, *e.g.*, the Nilgiris, that cultivators have begun to realise the advantage of using artificial fertilizers for potatoes.

India produces annually 491 lakh maunds of potatoes, of which 38 lakh maunds are produced in the hills and the remainder in the plains. Taking the country as a whole it is found that average total production of the winter crop amounts to 443½ lakh maunds and that of summer to 47½ lakh maunds.

The seasons of planting and harvesting vary from province to province. The harvesting of the crop in the plains starts in December and continues till March. The produce also starts coming into the market at the same time and may continue till about June. From April onwards, however, the supplies in the plains are comparatively low. The supplies of the hill potatoes start from July-August and continue till the beginning of December, being at their maximum from the middle of September to the beginning of November. The periods of lowest supply are, therefore, from June to August and again from November to about the middle of December.

The seed supply is important. Apart from imported seed, the total quantity retained for this purpose in India amounts

annually to 7,932,200 maunds or 16.1 per cent of the total annual production. Bihar is the most important province in this respect and accounts for nearly half the total quantity. Next in order of importance is the United Provinces accounting for 34.2 per cent of the total quantity retained for seed. These two provinces together account for 78.4 per cent of the total quantity retained for seed purposes in India. The amounts retained as seed in Bihar, Madras, Assam, Kashmir, Bengal, North-West Frontier Province, Bombay and the United Provinces—where either the conditions for storing are favourable or the producers have acquired the necessary technique—represent fairly high proportions of the local produce namely 37.1 per cent, 24.2 per cent, 19.8 per cent, 12.6 per cent, 7.3 per cent, 18.5 per cent, 14.3 per cent and 12.0 per cent respectively of the potatoes produced locally. In other provinces and States like Orissa, Baroda and Hyderabad, practically no attempt is made at storing potatoes for seed purposes.

Potatoes either for seed or table use are imported mainly from Burma, Italy and Kenya Colony. Imports from Burma are received mainly at Calcutta and to a small extent at Madras, Coconada, Vizagapatam and Puri; from Italy at Bombay and Karachi; and from Kenya Colony mainly at Bombay.

The average annual quantity imported into India is more than 11 lakh maunds and constitutes 2.4 per cent of the total average annual supply of the country. The largest quantities are imported from Burma and amount to 73.5 per cent of the total imports. Next in order of importance are Italy and Kenya Colony, the imports from each country being 19.6 per cent and 5.5 per cent of the total respectively. Italian potatoes are largely used for seed purposes. About 65 per cent of the imports at Bombay and more than 50 per cent of the imports at Karachi are used for seed purposes and the rest for table purposes. 98 per cent of the imports from Kenya Colony are used for table purposes. It is worth noting that the imports from Kenya Colony during the past 15 years have increased steadily. In 1925-26, they were valued at Rs. 25,929 and in 1938-39, at over Rs. 4½ lakhs.

The period of heavy imports from all the countries is from July to December when local supplies in India are lowest. From January to June when the local supplies are in abundance, imports are small. It so happens that the potato season in the exporting countries, *viz.*, Burma, Italy and Kenya Colony starts when the local supplies in India are falling off. Thus the imports



have not got to face any serious competition from the local produce. The rain crop which is available in this season in the plains in the Bombay Presidency and the Mysore State is generally regarded as inferior in some ways to the imported produce. The produce of the hill crop is, however, superior. But this is not available in sufficiently large quantities to meet the demand. As these imports cost the country over Rs. 33 lakhs a year, it would seem worth while trying to devise some way of making up the deficiency.

In India, potatoes cannot, however, be successfully grown in the plains during summer. A possible solution of the problem would be to store the surplus produce of the main crop in the plains in cold stores and release it during the scarcity period. The prices of potatoes during March and April in the main producing centres range from Rs. 1-4 to Rs. 2 per maund while during the period July to November from Rs. 3 to Rs. 5-8 per maund. There is thus a fairly big difference in price at the two seasons. Storage would seem, therefore, to be a commercial possibility since it would apparently pay to store a portion of the supplies in March-April to be released for the market in July-November when supplies are low.

An alternative to cold storage is to produce greater quantities in the hills. Bengal imports very large quantities from abroad. It, however, also receives a part of its supplies from Khasi and Jaintia, Kumaon, Simla and the Nilgiri Hills. The possibility of increasing production in these hills deserves careful consideration. The main difficulty is apparently the cost of transport which prior to September 1939, was only Re. 0-12-4 per maund from Aungban (producing area in Burma) to Calcutta, but approximately Rs. 1-4 and Rs. 1-3 per maund respectively from Shillong (assembling market for the produce in Khasi and Jaintia Hills) and Simla to Calcutta.

Bombay imports potatoes mainly from Italy and Kenya Colony. The imports from the latter place are used for table purposes and could be dispensed with if local supplies were sufficiently increased. The position is, however, different in the case of imports of seed potatoes from Italy. It is reported that the Italian seed deteriorates in the course of a few years under Indian conditions and so fresh supplies have to be obtained to renew the stock. The solution of the problem, therefore, involves the production of fresh seed stock inside the country.

The case of Sind is not very different from that of Bombay. There are no suitable hills in Sind where potatoes can be grown in summer and so she has to depend for her supplies on foreign

countries during that season. As regards seed, unless some varieties are introduced to replace the Italian variety, imports will have to be obtained from Italy. Trials should, therefore, be made with the *Gola* type. Alternatively, the exchange of seed with Baluchistan should be organised.

The quantities of potatoes exported from India amount to approximately 93,892 maunds valued at Rs. 2,81,300. The exports are not very large owing to the great demand for the produce within the country. There are, however, quite good prospects of increasing the export trade if the production could be increased.

The net available supply of potatoes (excluding home-grown seed) put on the market in India amounts to 36,888,000 maunds valued at Rs. 7,09,62,000. Out of this 1,156,000 maunds valued at Rs. 33,19,000 are derived from foreign countries in which the shares of Burma, Italy and Kenya Colony respectively amount to 73·5 per cent, 19·6 per cent and 5·5 per cent.

Potato cultivation in Burma is a recent development. The area under potatoes based on the average of the five years, 1934-35 to 1938-39, is about 29,700 acres. The Shan States are by far the most important area accounting for 87 per cent of the total production. Acreage in Shan States has definitely shown an upward trend. The causes for this are firstly, the increase in demand for the produce in the Indian markets and secondly, the development of easy means of transportation. In Burma, there are three crops, namely, the "summer", the "rain" and the "winter" crop. Their harvesting seasons are May and June, August and September, and December and January respectively.

About 850,000 maunds of potatoes are exported annually from Burma to India. The exports are heavy during July to December when local supplies in India are lowest and small from January to June, when they are abundant.

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## CHAPTER II.—UTILISATION AND DEMAND.

### A.—Utilisation.

Statistical data in the nature of actual records of quantities used for consumption and seed purposes and the quantities lost during storage and in the process of marketing are not available. Below are given estimates which are based on information obtained by personal contact between the marketing staff and producers, merchants and others engaged in the potato trade. They are, therefore, only approximations.

#### (1) FOR INTERNAL CONSUMPTION.

The country's requirements may be summarised as under :—

(a) *Domestic consumption.*—Potatoes are mainly used for table purposes and are not put to industrial uses. The annual net supply amounts to 50,259,000 maunds. Of this, 8,164,000 maunds or 16·2 per cent of the net supply are set aside for seed, 94,000 maunds or 0·2 per cent are exported to foreign countries and the remaining 42,001,000 maunds which constitute 83·6 per cent of the net supply are kept for human consumption. Out of this quantity, say, 10 per cent or 4,200,100 maunds are estimated to be lost in storage and handling. Thus the quantity actually consumed amounts to 37,800,900 maunds per annum.

(b) *Seed.*—The seed rate per acre in the different provinces and States varies according to the nature of soil, the quality of tubers used and the time of planting, etc. (For details see Chapter on "Seed"). About 8,164,000 maunds, including the seed potatoes imported from abroad, are annually set aside for seed purposes. Out of this quantity, 4,353,000 maunds or 53·3 per cent are estimated to be wasted in storage, so that the actual quantity used as seed amounts to 3,811,000 maunds.

#### (2) SUMMARY OF UTILISATION.

The estimated figures of annual utilisation of potatoes are given in the following table and are also represented diagrammatically opposite page 31.

Supplies. (In maunds)		Utilisation. (In maunds).	
Total production	49,103,000	Total exports	94,000
Total imports	1,156,000	Seed requirements	3,811,000
		Domestic consumption	37,800,900
		Wastage	8,553,100
Grand total	50,259,000		50,259,000

### B.—Demand.

#### (1) QUANTITATIVE.

(a) *Requirements for domestic consumption.*—Roughly 49,103,000 maunds of potatoes are produced annually in India out of which about 94,000 maunds are exported. To supplement the local supplies, about 1,156,000 maunds are imported from abroad. Thus, on the whole, 50,165,000 maunds of potatoes are used in the country. Of this quantity, 3,811,000 maunds are used annually

for seed purposes, and about 8,553,100 maunds are estimated to be lost in storage and in the process of distribution. So the net quantity utilised for table purposes is estimated at 37,800,900 maunds. Taking the population of India at 362,740,000, the annual *per capita* consumption comes to 8.6 lb. As compared with other countries, this is very low. In the United States of America and Germany, for example, the *per capita* consumption is approximately 140 and 440 lb. per annum respectively. In the United States of America about 70 per cent of the home produce is utilised for the table, in Germany about 28 per cent and in India 77 per cent of the whole produce. But even then the rate of consumption in India is extremely low.

In Burma, the quantity consumed annually is estimated at 571,500 maunds and the *per capita* consumption on the basis of estimated population for 1938 works out at 3.0 lb. This is very low indeed and is due mainly to a prejudice amongst the Burmese against the eating of potatoes.

The annual *per capita* consumption in different provinces and States is given in the following table :—

*Estimated per capita consumption in different provinces and States.*

Name of province or State.	<i>Per capita</i> consump- tion. (In lb.)
United Provinces . . . . .	28.
Bihar . . . . .	16
Bengal . . . . .	12
Assam . . . . .	12
Bombay . . . . .	8
Madras . . . . .	2
Punjab . . . . .	5
Central Provinces . . . . .	2
Sind . . . . .	13
Orissa . . . . .	9
Mysore . . . . .	8
Kashmir . . . . .	3
Baroda . . . . .	3
Hyderabad . . . . .	0.4
Travancore . . . . .	0.2
India . . . . .	8.6
Burma . . . . .	3.0

The *per capita* consumption is highest in the United Provinces (28 lb. per annum). Next in order of importance are Bihar and Sind with 16 lb. and 13 lb. respectively. Then follow Bengal and Assam with 12 lb. per head in each case. Consumption is comparatively high in the United Provinces, Bihar and Assam because potatoes are cheap and plentiful during the potato season. The population of the United Provinces and Bihar is largely vegetarian and this is an additional reason for the high consumption of potatoes in these provinces. In the case of Sind, the high rate of consumption (13 lb.) may perhaps be due to the comparatively low production of other vegetables for want of adequate irrigation facilities. The consumption of potatoes in Orissa is also fairly high being 9 lb. per head per annum, though local production is not very great. This may be due to a high percentage of vegetarians in the population and to the nearness of Bengal and Bihar, which have a fairly large surplus to dispose of during the potato season. In the Mysore State also the consumption is fairly high, being 8 lb. per head per annum and this is due to high local production.

The consumption in Bombay Presidency (8 lb.) is also fairly high and this may be due to the fact that this province produces fairly large quantities of potatoes both in the summer and winter seasons.

The *per capita* consumption in Madras, the Punjab, the Central Provinces, Hyderabad, Baroda, Travancore, etc., is comparatively low ranging from 0.2 to 5 lb. In the three provinces mentioned above considerable quantities of potatoes are no doubt produced, but production is confined to a few centres only and the produce has to be transported over long distances. This adds to the cost and results in low consumption in the non-potato producing areas. In other parts, the quantities consumed are rather small and the consumption is mainly confined to the urban areas.

The consumption of potatoes all over the country is relatively high in the urban areas. For example, the *per capita* consumption in Bombay city is estimated to be 31 lb., whereas the average *per capita* consumption for the presidency works out at 8 lb. only. In rural areas, where potatoes are not produced, there is no machinery for distribution. Moreover, outside the producing areas, the potato becomes a relatively costly vegetable and is not within the means of every one. The well-to-do farmers and village artisans, however, do purchase small quantities sometimes when they go to the towns for the sale of their produce or in some other connection.

(b) *Demand for export.*—A little less than one lakh maunds of potatoes are exported annually. This is a very small quantity and amounts to only 0.2 per cent of the total production in the country. At present, the demand is mainly from Ceylon and to a small extent from ports in the Persian Gulf. In Ceylon, the home produce is insufficient for the local requirements and so she imports about 353,150\* maunds of potatoes annually. 21 per cent of this amount is supplied by India and the rest is obtained from other countries. Ceylon being close to India, it should be possible to capture this market. But as the present production in India is hardly sufficient to meet the local demand, large quantities are not available for export.

The demand in Ceylon is mainly for the *Italian White Round* variety, which is grown extensively in Bombay, Sind and Mysore. There is a certain amount of demand also for the *Great Scot* variety, which is at present exported from Madras. From Sind and Mysore fairly large quantities of the *Italian White Round* varieties are exported but very small quantities are exported from Bombay because of the high local demand.

There seem to be possibilities of increasing the exports from Karachi and Bombay to the ports in the Persian Gulf. But at present there is not much scope for increasing the production in Sind owing to the water scarcity in the Malir tract, which is one of the most important areas for potato cultivation. In Upper Sind, where ample irrigation facilities are available, there seems to be some scope. In this case, however, the transport charges would be a serious factor, but if cheap freights to Karachi could be introduced, there are chances of increasing the area under potatoes. In Bombay, in view of the strong local demand and the possibilities of export, there appears to be scope for extending cultivation in the Dharwar, Poona and Belgaum districts, which are not very far from the coast.

The annual estimated exports from Burma to India amount to 849,000 maunds. This represents 48·8 per cent of the total production of Burma.

Burma has, at present, a great advantage for the export of her surplus produce to India. The main season for potatoes in Burma is from July to November when the supplies in India are deficient and prices are at their best. During this period, the crop of the hills, *viz.*, the Khasi and Jaintia, Kumaon, Simla and Nilgiris is no doubt available. But the produce of these hills cannot compete successfully with the Burmese potatoes in such areas as Bengal, Eastern United Provinces, Bihar and Orissa on account of comparatively higher freight charges. The season of potatoes in Burma closes when the main crop in Bengal, Bihar and the United Provinces comes into the market. So the produce from Burma does not face any serious competition. There is no special demand for the Burmese potatoes. They sell simply because they are on sale. On the other hand, the produce of the Simla Hills, Nilgiris and Shillong is preferred by a certain section of the public. Burmese potatoes will continue to find a ready market in India as long as the Indian production is not increased during the period from July to November.

(c) *Demand for industrial uses.*—At the present moment there is no demand in India for potatoes for industrial purposes or for any other use such as cattle-feeding, etc. In countries like Germany, Czechoslovakia and Poland, about 28 to 35 per cent of the total produce is utilised for stock feeding. They may be fed to animals in the raw state or after cooking. The latter method is preferable from the point of view of health. The absence of any potato surplus to human requirements allows no scope for feeding the same to animals under the present conditions.

The heavy imports from Burma, Italy and Kenya Colony clearly indicate a shortage of production in India. However, the imports from these countries are received during the period when the Indian supplies are low. From January to April the supplies in India are abundant and the potatoes in some parts sell as cheap as a rupee per maund and inferior qualities even cheaper. In such cases there might appear to be possibilities for using potatoes for industrial purposes. In the United Provinces, at Farrukhabad, an important potato producing centre, a starch factory was started about 20 years ago but it did not work successfully.

It is not feasible to run an industry on a fortuitous and occasional surplus, or to run a factory successfully for two or three months in a year only. Potatoes might, however, be used as an additional raw material in a factory operating mainly on other produce. It may be observed that in those countries where potatoes are used for industrial purposes heavy yielding starchy varieties are specially grown usually under contract arrangements with a factory.

(d) *Note on potato products.*—The industrial products which are prepared from potatoes directly or indirectly are farina or potato-starch, potato flour, dried potatoes, alcohol, glucose, dextrin, etc.

*Farina.*—This is prepared by grinding potatoes and washing and drying the liberated starch granules. The yield of starch depends upon the quality of potatoes used. Cull potatoes having a low starch content generally give an yield of about 15 per cent of the raw material used. Yields of farina from potatoes of high starch content are proportionately higher. Roughly, the ratio of starch obtained to the quantity of potatoes utilised is 1 : 7. Farina is used for laundry purposes, and sizing yarns in the textile industry and in the preparation of puddings, pastry, confectionery, custard powders, pie fillings, ice cream, etc.

In India, farina is largely used in the textile mills. On the average, 119,022\* maunds of farina and potato flour valued at Rs. 6,72,989\* are imported from foreign countries. In addition to this, 335,444 maunds of other starches are also imported. These figures clearly indicate the possibilities of starting a farina industry in this country. If the entire demand for farina and potato flour were met from within India there would be scope for increasing the area under potatoes by 10,000 acres. There is no dearth of land suitable for potato cultivation. The main question to be tackled is a reduction in the cost of cultivation. For this it would be necessary to select heavy yielding types and to provide cheap credit for manures, seed, etc., to the cultivator and to introduce economical methods of storing the seed potatoes. The latter is an important limiting factor in potato cultivation in this country, since, at present, the seed in most cases accounts for more than 50 per cent of the total cost of cultivation. The possibilities of increasing the area under potato cultivation with a view to providing an industrial raw material is dependent on two main factors, *viz.*, increased yield and reduction in the cost of seed.

*Dried potatoes.*—Preparations known as dried, sliced, cubed, shredded or riced potatoes are all prepared by either hot-air dehydration or by steaming, crushing, drying and flaking the pulp by passing it through hot rollers. These preparations, especially the sliced and flaked potatoes, are either used for human consumption or for feeding the animals. The potatoes can also be dried in the sun. Dried potatoes are very useful in being handy, safe for prolonged preservation and suitable for conveying over long distances. The yield of the finished product is roughly 20 per cent of the raw material used.

The dried potatoes play an important part particularly during a war. In India till recently potatoes were not dried but due to the War, this work has been started on a commercial scale by one or two firms. At present, the potatoes are dried in the sun. This method is very unhygienic and the finished product does not attain the desired colour. Potatoes properly prepared and hydrated should be white or very light yellow in colour and translucent and should not have more than 10 per cent moisture. When broken, the fracture should be sharp and the interior of the pieces should be flinty and not mealy. In drying potatoes in the sun quite a lot of space is taken up for spreading them out and very often due to rains and cloudy weather the finished product gets spoiled. In the summer months, it takes two or three days for the potatoes to dry up but in winter months when the sun is not very hot, it takes much longer time.

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\*Average for 1933-34 to 1937-38—Sea-borne Trade of India.

In foreign countries, several types of dehydrators depending upon the different methods of air circulation and temperature control are used for drying of potatoes. The potatoes can also be dried in the flue-curing barns which are being used at present for curing tobacco. The barns are generally 16' × 16' × 16' in size and are built of bricks. For drying, heat is provided from a cast iron furnace inserted in one of the walls of the barns at the ground level. The heat from the furnace is conducted through iron pipes 12 inches in diameter. These pipes are laid down on the floor of the barn. Control of heat and humidity is effected by ventilators in the front and back walls and in the roof along the ridge. The ventilator in the roof is provided with side plates of iron sheet which can be raised and lowered at will by means of ropes and pulleys. The ventilators in the walls are usually 24" × 18" and are fitted with iron shutters which can be lowered and raised at will. A small glass window is also fitted on one of the walls for the inspection of a thermometer, which is hung inside the barn for recording temperature. The interior of the barn is fitted with five tiers of wooden poles running horizontally across the barn 4 feet apart, the lowest tier being at six to seven feet from the ground. The distance between the different tiers is two feet. Bamboo sticks are placed across the wooden post 6 inches apart and date palm mats are put over them on which the potato slices are finally spread out for drying. A brief description of the methods of drying of potatoes in the sun and in the barn and the cost of drying in both cases are given in Appendix XII.

*Alcohol.*—This industry is carried on at a very extensive scale in Germany. Approximately, one ton of potatoes yield 20 gallons of 95 per cent alcohol\*. Apart from alcohol manufacture, the process is important on account of its offering a distillery residue—rich in nitrogen, phosphorus and potash—which forms a good ration for the livestock.

So far as is known, potatoes are not used for this purpose in India although it is claimed that some villagers, particularly in Burma, occasionally manufacture illegally small quantities of country liquor from potatoes.

*Dextrin and glucose.*—Dextrin is an intermediate product between starch and glucose and is obtained by heating the former alone or with diluted acid. Potato-dextrin fetches a higher price than maize-dextrin in the market. Glucose, the final product of the reaction, is mainly used for medicinal purposes and there is a considerable demand for it in India.

With low yields and correspondingly high cost of production, there does not appear to be much scope in India at present for manufacturing farina, alcohol, dextrin, glucose, etc. from potatoes. Rice contains 78 per cent of starch of which 90 per cent can be extracted, whereas potato contains a maximum of 25 per cent of starch, of which only about 65 per cent can be extracted. The available starch in rice is, therefore, four times as high as in potatoes. Consequently the price of potatoes used for manufacturing these products would have to be about one-fourth the price of broken rice before any attempt could be made to manufacture potato-starch in this country.

As regards stock-feeding, it is generally the surplus produce which is utilised in this way in other countries. But, for this purpose, the question of cost rules out potatoes as uneconomical when compared with other foodstuffs which are available at comparatively lower prices.

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\*Sir Fredrick Nathan : " Sources of power alcohol."



## (2) VARIATIONS IN DEMAND.

(a) *Seasonal fluctuations.*—Potatoes are consumed all the year round. There is, however, a considerable rise and fall in consumption in different parts of the year. The demand is high during the winter and spring seasons when the prices are low and local produce is available in large quantities.

In the plains of Northern India and in the Mysore State, very large quantities of potatoes are harvested from December to March. The supplies are generally stored till May and in some parts till July. The demand is keen in the beginning of the season as new potatoes taste better. But the quantities consumed are not large because of high prices. It has been reported from Bihar that in the beginning of the season, for a few days only, potatoes fetch as high a price as 8 to 12 annas per seer. Larger quantities are consumed as the season advances, the maximum consumption being in the months of February and March when the bulk of the crop is put on the market. From March onwards, there is a gradual decline in demand due to rise in prices. During May, although the prices are high, the demand continues fairly high on account of the scarcity of other vegetables. In June, however, a number of summer vegetables such as pumpkin, brinjal, lady's finger, cucumber, etc., come into the market in large quantities.

In the rainy season, i.e., during July and August, the supplies of summer vegetables continue to be heavy and potatoes are rather scarce. The poorer classes often gather edible herbs from fields and pastures and use them as vegetables. This is particularly so in the Punjab, North-West Frontier Province, Central Provinces and the United Provinces. Mushrooms are also abundant in the rainy season and are largely used in rural areas for making curry instead of potatoes. During this part of the year, mostly imported potatoes are available for consumption particularly in Northern India. As, however, they are costly, the demand for them is comparatively small. In September and October, the supplies of other vegetables generally decrease and the demand for potatoes rises again. But the quantities available being insufficient, prices remain high and consumption is thereby checked.

The season of the largest consumption in the South, particularly in the Nilgiri Hills, is from July to November when potatoes are plentiful in the surrounding areas.

Consumption of potatoes increases considerably during religious festivals and fairs such as *Diwali*, *Dussehra*, etc. The demand also increases on Hindu fast days as potatoes are amongst those few articles the eating of which is permissible during the fast.

The factors which influence the demand for potatoes in Burma are the same as those mentioned in the case of India. As already stated, the demand as a whole is low but consumption increases during the time of local harvest when the prices are low and on the occasion of religious festivals and fairs.

(b) *Trend.*—As will be seen from Appendix V, the acreage under potatoes has increased appreciably during the past nine years. Assuming that there has been no fall in the average yield per acre, it indicates a corresponding increase in the local production. The export position remained practically unaltered. Imports, on the other hand, have steadily increased during the last 10 or 15 years. All these tend to show that there has been a considerable increase in the consumption of potatoes. This is mainly due to its mild flavour of which one does not get tired easily. Moreover, it lends itself readily to the preparation of many pleasing combinations with foods of

more pronounced taste. Another reason for its popularity is that it is more easily handled, is less perishable than other vegetables and is available all year round.

### (3) QUALITATIVE.

(a) *Varieties in demand.*—The quality of the potato varies according to variety, the type of soil on which it is grown and the conditions under which it is cultivated. Certain varieties are considered more palatable than others. Potatoes grown on red soil are stated to have better keeping qualities and taste better than those grown on black soil. Hill potatoes are generally preferred to those grown in the plains, particularly those grown in rainy seasons which are watery and somewhat insipid in taste.

An average consumer in the country wants potatoes of a medium size, say, about  $1\frac{1}{2}$ " to 2" in diameter, having smooth skin and free from blemish. The preference for a round potato is particularly strong in Bombay. A section of the consumers attaches some importance to colour also on sentimental grounds. In Sind, for example, the *Surkha* variety (*Darjeeling Red*), though grown successfully for a number of years, had to be discarded on account of its red colour which did not find favour with the orthodox Hindus.

Varieties with deep eyes are not very popular, as their peeling, apart from being a difficult process, necessitates the throwing away of a considerable portion of the flesh. Potatoes having a whitish or light brown skin and having a smooth surface are preferred.

In the consuming markets, potatoes are generally known as *desi* (grown in the plains) and *pahari* (grown in the hills) according to the source from which they are obtained. In some cases, they are further classified as round or long. In most places, where a number of varieties are grown, the produce is sold mixed.

The potatoes imported in Calcutta from Burma, for example, are sold under the name *Rangoon* or *Sitbo*. This name does not refer to any particular variety, but signifies potatoes of a certain shape and appearance without regard to variety. Tubers of long varieties such as *Up-to-date*, *Ally* and *Kidney* (*Bengala*) are mixed together and are sold as *Sitbo*. Sometimes, the mixture contains even the tubers of round varieties.

In the Nilgiri Hills, two varieties, namely, *Great Scot* and *Royal Kidney*, are grown on commercial scale. The large sized tubers are separated and sold as *Round* and *Kidney* respectively and the rest are sold mixed under two or three different names according to size, i.e., *Rasi*, *Podi*, etc. The potatoes produced in Kumaon and Simla Hills are sold in different markets under the names of *Nainital* and *Simla* respectively. But actually the produce in each case consists of more than one variety. In Kumaon Hills, for example, there are more than half-a-dozen varieties, namely, *Long Keeper*, *Long Bean*, *Ag Khabrar*, etc. But none of them is known by its correct name in the plains. The produce is generally mixed and is sold under one name i.e., *Nainital*. The same may be said of Shillong potatoes, which include a number of varieties and are sold mixed in the consuming markets. This, however, does not mean that the consumer wants mixed produce. On the contrary, he would certainly prefer to have the pure stock of different varieties, each of which has its own qualities, and would be prepared to pay a higher price.

The growers and the wholesale merchants are generally responsible for the mixing of the produce. The former have generally no suitable storage accommodation. They usually store the produce in the room in which they themselves live. If a number of varieties have been grown, as is usually the case, their mixing together during storage cannot, therefore, be avoided. In many cases, the seed stocks used by the growers are badly mixed. The produce must also, therefore, be a mixture of a number of varieties. The godowns of the merchants are generally situated in big towns where rents are high. In order to reduce costs, the produce of the different varieties is kept in the same room where it gets mixed up. However, when the produce reaches the retailer, he sorts it out according to shape, size and colour and sells the different lots separately.

As already pointed out in the Chapter on "Supply" a great confusion exists about the names of varieties grown in different areas. The consumers and dealers have generally no idea about them and a number of varieties are often known by the same name in different places.

As a rule, the hill potatoes are preferred to those grown in the plains, though the variety may, in some cases, be the same. This is largely due to the difference in the soil and the climatic conditions. So far as the demand for seed is concerned, while selecting a variety, very little attention is paid to the consumer's requirements. The yield is the principal consideration. Varieties which give a higher yield are usually selected. *Phulwa* is the most important in this respect and is largely grown in Bihar, Orissa and the United Provinces and to a small extent in the Punjab, Bengal, the Central Provinces, Gwalior and Patiala. It is a very hardy variety and gives a fairly high yield. At the same time it has good keeping and cooking qualities. But it is not frost-resisting and its crop takes long (about  $4\frac{1}{2}$  to 5 months) to mature. It cannot be grown successfully in the Punjab, Sind and Bombay on account of the possibility of frost. In these parts, a variety which has a crop of short duration and is frost-resisting is more in demand. The Italian varieties are largely in demand both for seed and table purposes in Bombay, Sind, the Central Provinces, Mysore, Hyderabad and Gwalior. The crop of the *Italian White Round* variety takes about three months to mature. It grows well under the conditions obtaining in those provinces and States. It might do well in the Punjab also, but so far no one seems to have given it a trial. The varieties largely in demand in the Punjab are the *Surkha*, *Bhutani*, *Gola*, *Dehra Dun* and *Khera Chamba*. The *Surkha* is to a certain extent frost-resisting and the duration of its crop is about three months. The duration of the crop of the other two varieties is only 65 to 75 days and so they escape the frost. *Surkha* remains firm after cooking and is generally liked by all classes, particularly the non-vegetarians, who cook meat and potatoes together. The orthodox Hindus, however, do not like this variety on account of its red colour.

In Bihar, the varieties in demand for seed are the *Phulwa*, *Surkha* and *Satha*. The *Satha* variety is preferred for the early crop as it takes only about 60 days to mature. The *Surkha* and the *Phulwa* varieties are in demand for the late crop. All the three varieties have good cooking qualities. The *Surkha*, however, is not a good keeper and is, therefore, not favoured so much by traders and consumers.

In the United Provinces, *Phulwa* variety of the plains and *Long Keeper* of the hills are in great demand. The former has whitish round tubers with shallow eyes. It remains firm after cooking and gives a delicious taste and a pleasant flavour. The *Long Keeper* has a whitish skin and is oval in shape.

It becomes mealy on boiling and has a good taste and is specially preferred by the Europeans. *Kabra* of the plains and *Long Bean* (Garhwal) of the hills are the second favourites. The former resembles *Phulwa* and the latter has flat brown tubers, which are slightly knobbed and remain firm on boiling.

The varieties largely in demand in Bengal are *Up-to-date* and *Ally*, which are imported in large quantities from Burma. Other varieties consumed are *Nainital*, *Arran Consul* and *Factor*. The *Satha* variety, which is imported from Bihar, is also in demand in Calcutta from the end of November to the middle of December before the local crop is ready.

In Assam, the varieties largely in demand are *Arran Consul*, *Factor*, *Up-to-date* and *Talisman*.

In Madras, the variety mostly in demand is *Great Scot*. There is a certain amount of demand also for *Royal Kidney*, which is grown on a small scale.

The varieties consumed in Bombay market are *Italian White Round*, *Mombasa* and *Great Scot*. All of them, excepting *Mombasa*, which is flattish, are round in shape. Somehow, the Bombay market has developed a special preference for round varieties.

In Mysore State, the varieties in demand are *Rickets* and *Italian White Round*. The former is said to have a better taste than the latter but, owing to its poor keeping qualities, it is not so largely grown.

In Burma, the *Up-to-date* and *Ally* varieties are largely in demand owing to their large size and good cooking qualities. These varieties are commonly known as *Sitbo*. Other varieties grown in Burma are *Bengala* and *Shan*. The former is a kidney-shaped variety with a white flesh, and the latter has small deep eyes and yellow flesh. Both of them are considered inferior to the other two varieties.

(b) *Demand from different groups of consumers.*—Potatoes are in demand by all classes of people. The well-to-do people, consisting of Europeans and Indians, generally prefer potatoes of about  $1\frac{3}{4}$ " in diameter among the long varieties and  $2\frac{1}{4}$ " in diameter among the round ones. Extra large potatoes are usually not much appreciated. The poor people generally consume potatoes of a smaller size on account of their lower price. The Europeans generally prefer the hill potatoes, which, in most cases, have a whitish flesh and as they become floury after cooking they are particularly suitable for mash making. The Indians, as a rule, like potatoes which remain firm after cooking. This is particularly so in the case of Muslims who greatly relish a curry prepared by cooking meat and potatoes together.

The *halwais*, who use potatoes for various preparations, generally prefer those which are starchy or floury. Size is not of much importance with them and so they usually buy small potatoes as they are cheap.

The quantity of potatoes consumed by an average European family is greater than that by an average Indian family of the same status and position. Amongst the Indians, the vegetarians probably consume potatoes twice as much as the non-vegetarians.

The Burmese are, as a rule, not very fond of potatoes, because of a belief that they cause stomach troubles. The educated classes are, however, gradually getting over this. At present, the largest potato consumers in Burma are the Europeans and the Indians.

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## INTER-CHAPTER TWO.

In India, potatoes are mainly used for table purposes and are not put to industrial use, *e.g.*, in the production of starch. The annual net supply amounts to 50,259,000 maunds, of which over 81 lakh maunds or 16·2 per cent are set aside for seed, 94,000 maunds or 0·2 per cent are exported to foreign countries and the remaining 42,001,000 maunds or 83·6 per cent are for human consumption. Out of this quantity, 10 per cent or, say, 4,200,100 maunds are estimated to be lost in storage and handling. Thus the quantity actually consumed amounts to 378 lakh maunds per annum.

On the average of the total population, the annual *per capita* consumption comes to 8·6 lb. for the whole of India. The *per capita* consumption is highest in the United Provinces (28 lb. per annum) followed by Bihar and Sind with 16 lb. and 13 lb. respectively. In Madras, the Punjab, the Central Provinces, Hyderabad, Baroda and Travancore, consumption is comparatively low ranging from 0·2 to 5 lb. per head. The rate of consumption is relatively high in the urban areas. For example, the *per capita* consumption in Bombay city is estimated to be 31 lb. whereas the average consumption for the presidency works out at 8 lb. per head only.

At present there is no demand in India for potatoes for industrial purposes or for any other use such as cattle feeding, etc. The heavy imports from Burma, Italy and Kenya Colony clearly indicate a shortage of production in India. These are, however, received during the period when Indian supplies are low. From January to April, when supplies are abundant, potatoes in some parts sell as cheap as a rupee per maund and inferior qualities even cheaper. In such cases there might appear to be possibilities of using potatoes for industrial purposes. With this object in view, a starch factory was started about 20 years ago at Farrukhabad (United Provinces), an important potato producing centre, but it did not work successfully. This is not surprising as it is not feasible to run an industry on a fortuitous and occasional surplus of cheap potatoes during a part of the season. Such surplus potatoes might, however, be used as an additional raw material in a factory operating mainly on other produce. In countries, where potatoes are largely used for industrial purposes, heavy yielding varieties with high starch content are specially grown usually under contract arrangements with a factory. The factory is

thus assured of a fairly long working season and an ample supply of cheap raw material specially suitable for the production of farina, alcohol, glucose, dextrin, etc.

Farina is used for laundry purposes, and sizing yarns in the textile industry and in the preparation of puddings, pastry, confectionery, custard powders, pie fillings, ice cream, etc. In India, it is largely used in the textile mills. On an average, 119,022 maunds of farina and potato flour valued at Rs. 6,72,989 are imported from foreign countries. In addition to this, 335,444 maunds of other starches are also imported. These figures clearly indicate that there is scope for starting a farina industry in the country.

Alcohol manufacture is carried on very extensively in Germany. Approximately, one ton of potatoes yield 20 gallons of 95 per cent alcohol. Apart from alcohol manufacture, the process is important on account of its offering a distillery residue—rich in nitrogen, phosphorus and potash—which forms a good ration for livestock. So far as is known, potatoes are not used for this purpose in India, although it is claimed that some villagers, particularly in Burma, occasionally manufacture illegally small quantities of country liquor from potatoes.

Dextrin is an intermediate product between starch and glucose and is obtained by heating the starch alone or with diluted acid. Potato-dextrin fetches a higher price than maize-dextrin in the market. Glucose, the final product of the reaction, is mainly used for medicinal purposes and there is a fair demand for it in India.

With low yields per acre and correspondingly high cost of production there does not appear to be much scope in India at present for manufacturing farina, alcohol, dextrin, glucose, etc., from potatoes. Rice contains 78 per cent of starch of which 90 per cent can be extracted, whereas potato contains a maximum of 25 per cent starch of which only about 65 per cent can be extracted. The available starch in rice is, therefore, four times as high as in potatoes. Consequently, the price of potatoes used for manufacturing these by-products would have to be about one-fourth the price of broken rice before any attempt could be made to manufacture potato-starch in this country. The main problem, therefore, in the industrial use of potatoes is to reduce the cost of potato cultivation by selecting heavy yielding types with high starch content, providing cheap credit for manures, seed, etc., and by introducing economical methods of storing the seed potatoes which at present constitutes the largest item in the cost of production.

Potatoes are consumed all the year round, but there is a considerable rise and fall in consumption in different parts of the year. The demand is keen in the beginning of the season as new potatoes taste better, but the quantities consumed are not large because of high prices. During the winter and spring seasons, however, when the prices are low and local produce is available in large quantities, the demand is high. From March onwards, there is a gradual decline in consumption due to the advent of the hot weather and the rise in prices. During May, although the prices are high, the demand continues relatively high on account of the scarcity of other vegetables. In June, however, a number of summer vegetables, such as pumpkins, brinjals, lady's finger, cucumber, etc., come into the market in large quantities. During July and August, the supplies of summer vegetables continue to be heavy and Indian potatoes are rather scarce. Imported potatoes are, however, available for consumption, particularly in Northern India. In September and October, the supplies of other vegetables generally decrease and the demand for potatoes rises again. But the quantities available being insufficient, prices remain high and consumption is thereby checked. Consumption of potatoes increases considerably during religious festivals and fairs such as *Diwali*, *Dussehra*, etc., and on Hindu fast days, as potatoes are amongst those few articles the eating of which is permissible during a fast.

During the past nine years there has been a considerable increase in the consumption of potatoes. This is mainly due to its mild flavour of which one does not get tired easily. Moreover, it lends itself readily to the preparation of many pleasing combinations with foods of more pronounced taste. Other reasons for its growing popularity are that it is more easily handled, is less perishable than other vegetables and is available all the year round.

Some varieties and types are more in demand than others owing to their distinctive characteristics. Certain varieties, for example, are considered more palatable than others. Potatoes grown on red soil are stated to have better keeping qualities and to taste better than those grown on black soil. Hill potatoes are generally preferred to those grown on the plains, particularly those grown in the rainy season, which are watery and somewhat insipid in taste.

An average consumer in the country wants potatoes of a medium size, say, about  $1\frac{1}{2}$ " to 2" in diameter, having a smooth skin and free from blemish. The preference for a round potato



is particularly strong in Bombay. A section of the consumers attaches some importance to colour also on sentimental grounds. In Sind, for example, the *Surkha* variety (*Darjeeling Red*) though grown successfully for a number of years had to be discarded on account of its red colour which did not find favour with the orthodox Hindus.

Varieties with deep eyes are not very popular as their peeling, apart from being a difficult process, necessitates the throwing away of a considerable portion of the flesh. Potatoes having a whitish or light brown skin and having smooth surface are preferred.

In selecting the seed very little attention is paid to the consumers' requirements. The yield is the principal consideration. *Phulwa* is the most important in this respect and is largely grown in Bihar, Orissa and the United Provinces and to a small extent in the Punjab, Bengal, the Central Provinces, Gwalior and Patiala. It is a very hardy variety and gives a fairly high yield. At the same time it has good keeping and cooking qualities. It is not frost-resisting and its crop takes a fairly long time to mature (about  $4\frac{1}{2}$  to 5 months). It cannot, therefore, be grown successfully in the Punjab, Sind and Bombay on account of the danger of frost. In these parts, a variety which has a crop of short duration and is frost-resistant is required. The Italian varieties are largely in demand both for seed and table purposes in Bombay, Sind, the Central Provinces, Mysore, Hyderabad and Gwalior. The popular varieties in the Punjab are the *Surkha*, *Bhutani*, *Gola Dehra Dun* and *Khera Chamba*. The *Surkha* is to a certain extent frost-resistant. The growing period of this variety is about three months and that of the other two varieties only 65 to 75 days; so they escape the frost. The *Surkha* remains firm after cooking and is generally liked by all classes, particularly the non-vegetarians, who cook meat and potatoes together.

In Bihar, the varieties in demand for seed are the *Phulwa*, *Surkha* and *Satha*. The *Satha* variety is preferred for the early crop as it takes only about 60 days to mature. The *Surkha* and the *Phulwa* varieties are in demand for the late crop. All the three varieties have good cooking qualities. The *Surkha*, however, is not a good keeper and is, therefore, not very much favoured by the traders and consumers.

In the United Provinces, the *Phulwa* variety of the plains and the *Long Keeper* of the hills are in great demand. The former has



whitish round tubers with shallow eyes. It remains firm after cooking and gives a delicious taste and a pleasant flavour. The *Long Keeper* has a whitish skin and is oval in shape. It becomes mealy on boiling and is on that account specially preferred by many Europeans. *Kabra* of the plains and *Long Bean* (Garhwal) of the hills are the second favourites. The former resembles *Phulwa* and the latter has flat brown tubers, which are slightly knobbed and remain firm on boiling.

The varieties largely in demand in Bengal are *Up-to-date* and *Ally*, which are imported in large quantities from Burma. Other varieties consumed are *Nainital*, *Arran Consul* and *Factor*. The *Satha* variety which is imported from Bihar has also a good market in Calcutta from the end of November to the middle of December, before the local crop is ready.

Potatoes are in demand by all classes. The well-to-do people consisting of Europeans and Indians, generally prefer potatoes of about  $1\frac{3}{4}$ " in diameter among the long varieties and  $2\frac{1}{4}$ " in diameter among the round ones. Extra large potatoes are usually not much appreciated. The poor people generally consume potatoes of a small size on account of their lower price. Most Europeans prefer the hill potatoes, which in many cases have a whitish flesh and as they become floury after cooking, they are particularly suitable for mash making. The Indians as a rule like potatoes which remain firm after cooking. This is particularly so in the case of Muslims who greatly relish a curry prepared by cooking meat and potatoes together. The *halwais*, who use potatoes for various preparations generally prefer those which are starchy or floury. Size is not of much importance with them and so they usually buy small potatoes as they are cheap.

In Burma, the main season for potatoes is from July to November when the supplies in India are deficient and prices are at their best. The Burma season closes when the main crop of Bengal, Bihar and the United Provinces comes into the market. The produce from Burma does not, therefore, face any serious competition. There is no special demand for the particular type of potatoes grown in Burma. On the other hand, the produce of the Simla Hills, the Nilgiris and Shillong is preferred by a certain section of the public. Burmese potatoes, however, sell simply because they are available and they will continue to find a ready market in India as long as the Indian production is not increased during the period from July to November.

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## CHAPTER III.—PRICES.

## A.—Wholesale prices.

## (1) GENERAL.

The study of the prices of potato is rendered difficult by the absence of reliable data for a sufficiently long period. The government publications of the various provinces have paid little or no attention to this commodity. Only in a few places do we find any mention of potato prices in government records. For example, in some district headquarters of the Punjab, the local revenue officers maintain records of the prices of potato mainly for the benefit of other government departments such as jails, etc. Even this is not done in a systematic manner. At some places only wholesale prices are given, at others only retail prices. Again, as these records are not published, the producers, the merchants and the consumers do not derive any benefit from them.

Growers seldom keep any record of the prices realised. Some of the bigger potato merchants and commission agents, however, maintain accounts which have been examined and the data extracted. They are, however, generally silent about the variety and quality of the produce. Thus their usefulness is limited. For a proper comparison of prices it is essential that the price should relate to the same quality in each case. It is not possible to ensure this. Under these circumstances, all that can be done is to indicate the seasonal variation and trend of the prices of potatoes in general in some of the more important areas, with the help of the available data.

## (2) PRICES AT HARVEST TIME.

During the harvest season, the supply of potatoes is plentiful and the prices are as a rule low. Apart from supply and demand, the factors playing an important role in the determination of prices are distance of the market from producing areas, facilities for transport and storage and the financial position of the cultivator. If the farm is close to the market and good transport facilities are available the cost of transport will be small and so the difference between the market and farm prices will also be small. Moreover, the cultivators would be better informed about the market conditions and would thus be in a stronger bargaining position. If it is not necessary to sell the produce at once, and if storage accommodation is available, naturally it would not be offered for sale unless a favourable price is forthcoming.

The estimated annual harvest prices for some of the important potato producing areas are given in the following table which is based on Appendices XIII and XIV to XIV(d).

*Average wholesale harvest price (per maund).*

(1933 to 1937).

Markets.	1933.	1934.	1935.	1936.	1937.	Average.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Patna	..	..	0 15 0 to 2 8 0	1 4 0 to 2 8 0	1 3 0 to 2 8 0	1 2 0 to 2 8 0

*Average wholesale harvest price (per maund)—contd.  
(1933 to 1937).*

Markets.	1933.	1934.	1935.	1936.	1937.	Average.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Nainital . . . . .	..	2 4 0 to 3 5 0	2 8 0 to 3 15 0	1 14 0 to 3 6 0	2 1 0 to 2 14 0	2 2 9 to 3 6 0
Midnapur . . . . .	1 14 0 to 3 5 0	1 12 0 to 3 1 0	1 11 0 to 2 3 0	2 0 0 to 3 15 0	1 4 0 to 2 12 0	1 11 6 to 3 0 9
Sialkot . . . . .	1 4 6 to 3 5 9	1 7 9 to 3 0 9	1 8 6 to 3 13 3	1 4 6 to 3 3 9	1 6 9 to 2 11 6	1 6 6 to 3 3 9
Jullundur . . . . .	1 4 9 to 3 8 0	1 6 9 to 3 10 6	1 5 3 to 3 6 6	1 3 0 to 3 8 0	1 8 9 to 2 8 3	1 5 9 to 3 5 0
Hyderabad (Deccan).	..	2 13 6 to 5 7 0	3 7 9 to 5 13 0	4 5 0 to 4 10 0	2 14 6 to 5 0 6	3 6 3 to 5 3 9

From the above table it is evident that the wholesale prices at harvest time vary not only from place to place but also from year to year. The prices were comparatively high at Hyderabad (Deccan) because of the relatively low local production as compared with the demand. They were low in Patna where the conditions were just the reverse. The prices at Nainital have also been high due to the season of harvesting falling at a time when the supplies in the country are generally low.

There is also a considerable variation in the prices in the same season. They are low when the season is in full swing and high in the beginning and at the end. This is illustrated by the following example :—

*Monthly prices at Midnapur (Bengal) from 1933 to 1937.*

(Per maund).

Year.	December.	January.	February.	March.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
1933 . . . . .	3 5 0	3 2 0	1 14 0	2 0 0
1934 . . . . .	3 1 0	2 14 0	1 12 0	1 14 0
1935. . . . .	2 3 0	1 11 0	1 12 0	1 15 0
1936 . . . . .	3 15 0	2 13 0	2 0 0	2 0 0
1937 . . . . .	2 12 0	1 14 0	1 8 0	1 4 0
Average . . . . .	3 0 9	2 7 6	1 12 6	1 13 0

A glance at the preceding table shows that the average price is the highest in December, i.e., the beginning of the season when the supplies are small and the demand for the fresh produce is great. The price falls considerably in January and comes down still further in February, but rises slightly in March when the season is drawing to a close. It may, however, be noticed that the average price in February is Rs. 1-4-3 less than the average price in December. This is because the supplies in February are relatively more abundant and the demand is not as great as in December.

### (3) SEASONAL VARIATIONS IN PRICES.

A seasonal fluctuation in price is common to all agricultural commodities. This is particularly noticeable in the case of potatoes, which under Indian conditions cannot be conveniently stored on the farm on account of their perishable nature. Farm storage in the case of potatoes is the exception rather than the rule. The average monthly wholesale prices for a few years are given in Appendix XIII and variations in the prices in some of the important markets in different provinces are discussed below.

*United Provinces.*—The seasonal fluctuations in prices at Agra and Cawnpore are very great. High prices are realised in November and low in February, March and April. The difference between maximum and minimum prices is as high as Rs. 3-5-9 per maund at Agra and Rs. 2-13-6 per maund at Cawnpore. The differences between the maximum and the annual mean are Rs. 1-14-3 and Rs. 1-8-0 at Agra and Cawnpore respectively. The potato season commences in December when the prices begin to fall. They reach their lowest ebb in February, March and April. From May onwards they show an upward tendency as the supplies begin to fall off. The supplies of hill potatoes start from July and last up to November. Their prices in the Agra market range from Rs. 3-10-6 to Rs. 5-9-3 per maund and in Cawnpore market from Rs. 4-1-3 to Rs. 4-7-6.

*Bihar.*—Statistics are available for two important markets, namely, Patna and Darbhanga. The extreme range of variation occurs at Patna, between August and February and amounts to Rs. 2-10-9 per maund. As the diagram facing page 60 shows, prices have an upward tendency from March both at Patna and Darbhanga, till they reach the highest point in August. After this, they gradually decline and maintain a low level during November, December and January, and are lowest in February and March when the potatoes come into the market in large quantities.

In the Patna and Darbhanga markets, the highest average prices in August are 73 per cent and 61 per cent higher than the respective annual means, and the lowest in February and March are 45 and 33 per cent lower respectively.

*Bengal.*—In Bengal, the same tendency is noticeable as in the case of Bihar. As will be seen from the diagram facing page 60, the range of variation in prices is very wide at Midnapur, being Rs. 1-12-6 per maund in February to Rs. 5-0-6 per maund in September when local supplies are not available. The prices at Calcutta and Chittagong are the lowest in March after which they begin to rise gradually. From July onwards they maintain a fairly high level and are highest in November, when the supplies from Burma have dwindled. The decline in prices in harvest season is very much pronounced here specially from February to April, when they are almost half of those in November. The highest average prices in Calcutta and Chittagong are above the annual means by 44·8 per cent and 37·4 per cent and the lowest are below the annual means by 43·7 per cent and 33·5 per cent respectively.

*Bombay.*—In the Bombay market, the prices are low from January to April when the produce of the winter crop is put on the market. From May onwards, the prices begin to rise due to decline in the supplies, but in September they fall again due to the arrivals from the summer crop in the market. They remain low in October also but in November, due to supplies becoming small, they again rise and reach the peak in December when the average price is Rs. 4-5-9 per maund, being 20 per cent above the annual mean.

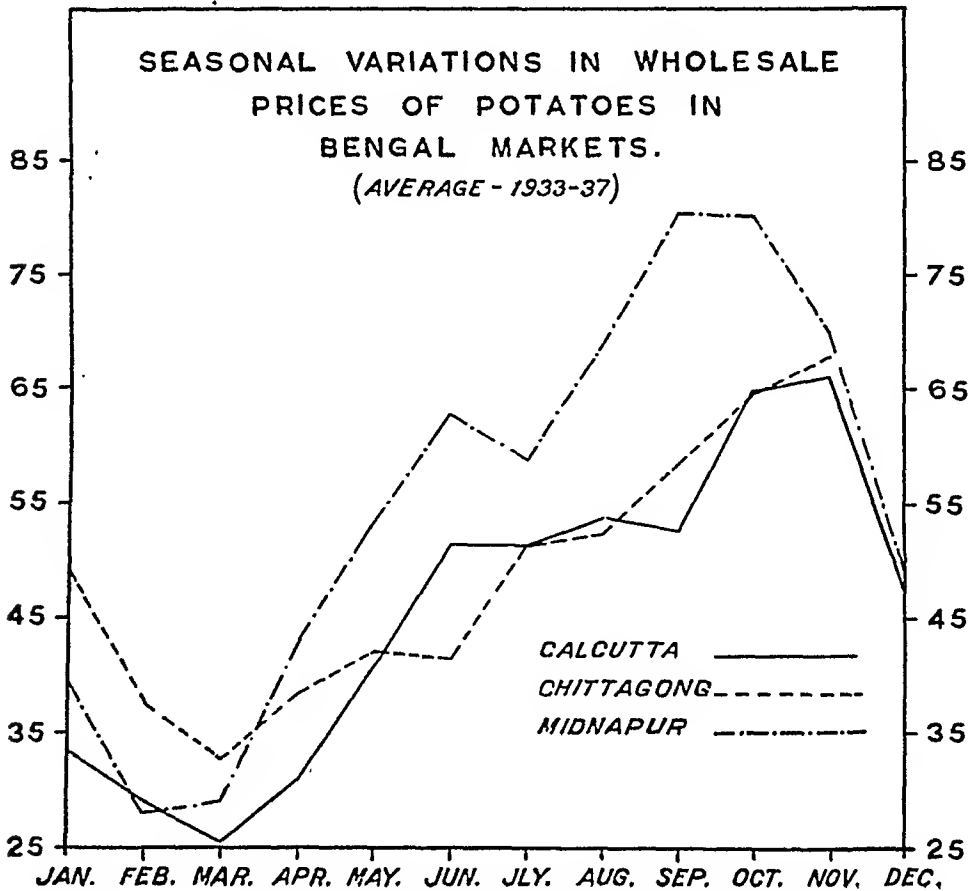
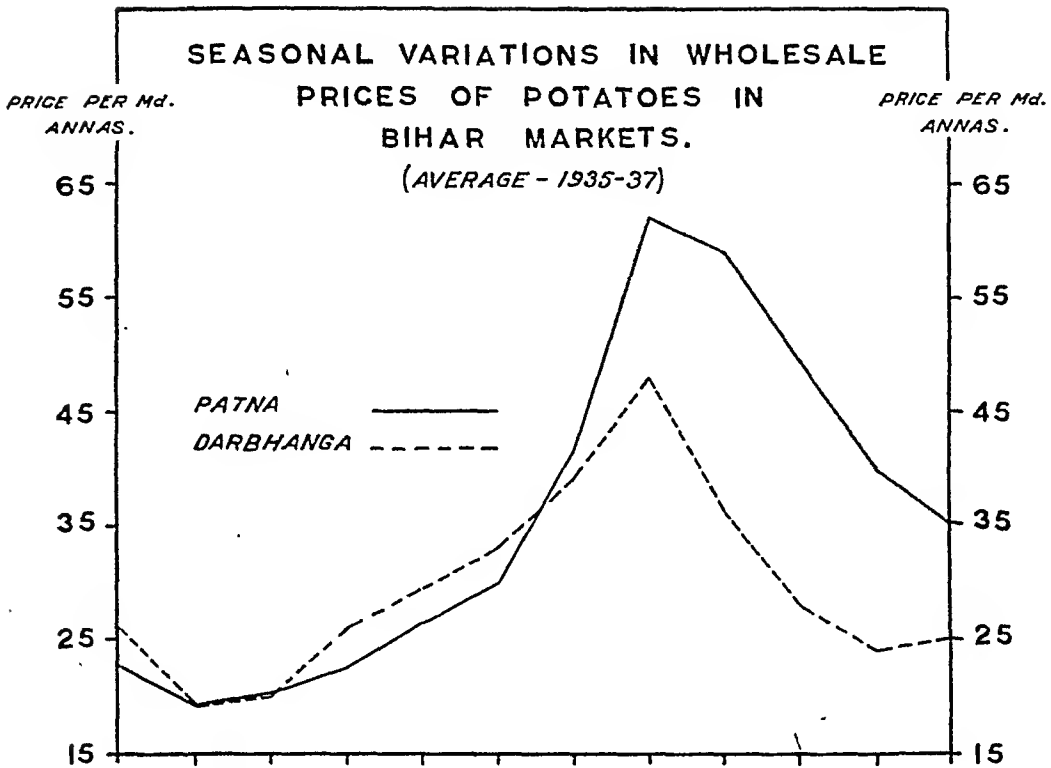
*Madras.*—As shown in the diagram facing page 61, the prices at Mettupalaiyam, the main assembling market for Nilgiri potatoes, are the highest in April when they are 21 per cent above the annual mean. Thereafter, on account of increase in supply, they gradually decline and reach the lowest level of Rs. 2-2-3 per maund in August. They maintain almost the same level in September and October but go up in November and December, and again show a tendency to decline from January. In February, they come down to a very low level when potatoes are sold at Rs. 2-2-9 per maund. The low prices are due to a fall in demand from Bombay and Mysore where the local supplies are available during this period.

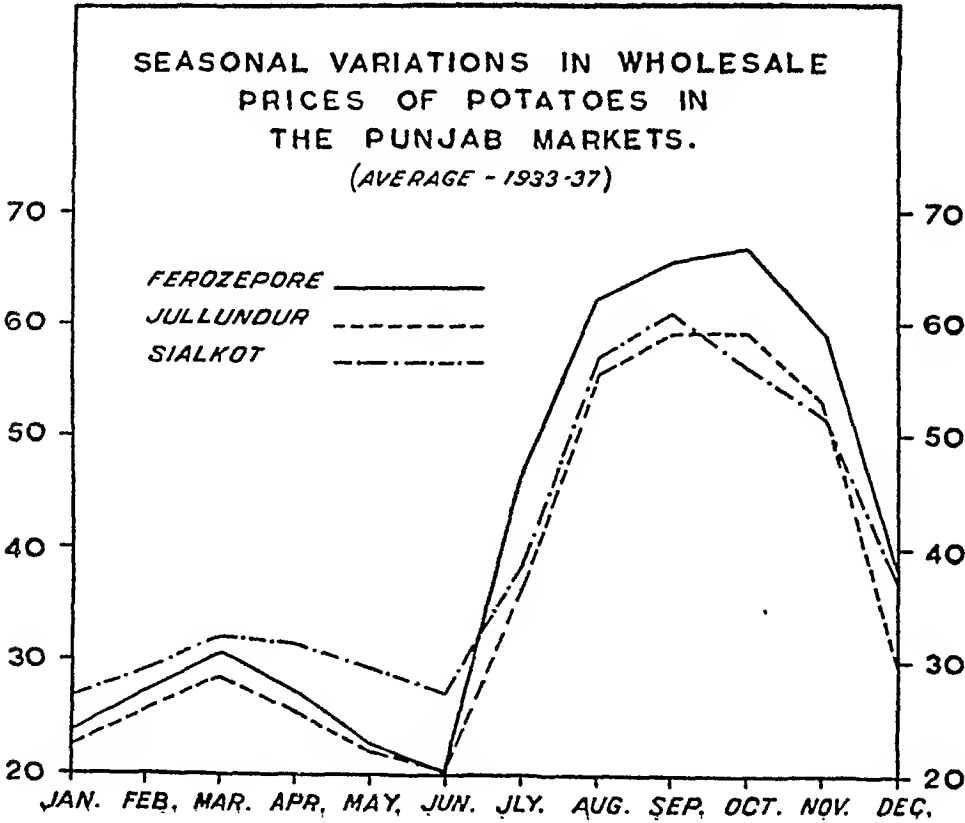
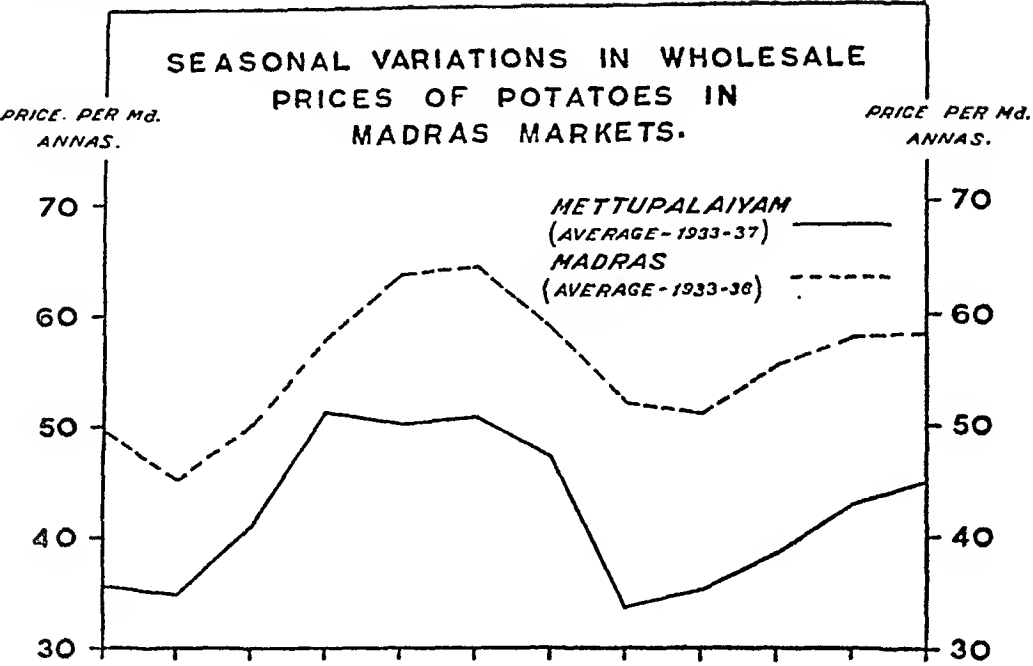
In the Madras market the prices remain high in May and June ranging from Rs. 3-15-6 to Rs. 4 per maund. From August onwards till October they are comparatively low due to heavy supplies, but begin to rise from November. The prices are the lowest from January to March on account of a further increase in the supplies, mainly from the Mysore State.

In the Madras Province as a whole, prices rise steadily from the month of April. In June they are usually high but from July onwards they decline and are low during August and September. The sudden fall from June to August is due to the new crop of Nilgiri Hills coming into the market. Prices recover again slowly after September and continue to rise up to December.

*Punjab.*—In the Punjab, the widest range of variation occurs at Ferozepur, the high point being in October and the low point in June. The difference between maximum and minimum prices amounts to Rs. 2-14-3 per maund. The prices are fairly low during the first half of the year, the lowest being recorded in June when the produce of the summer crop comes into the market. But after June there is a marked tendency for the prices to rise till the peak is reached in October. From November onwards, they begin to decline and with the commencement of the harvest season of the winter crop in December the decline is very marked. This is clearly seen from the diagram facing page 61. It is also noticed that the high and the low points at Ferozepur are above and below the average annual mean by 63 per cent and 50 per cent respectively.

Taking the province as a whole, a close resemblance exists in the movement of prices at the various important markets. It will be observed that in all the three markets, *viz.*, Sialkot, Ferozepore and Jullundur, the prices begin to rise in July and reach their highest level in September and October. Thereafter they follow a downward course reaching a very low level in January. This is again followed by a gradual rise in February and March. From April the prices begin to fall again and are lowest in May and June. The fall in January is due to the heavy supplies of the winter crop, and in May and June to those of the summer. From about the middle of July to the end of November the local supplies in the plains are not available and the demand is met by importing potatoes from other provinces and from the hills. Consequently the prices remain high during this period.





*Mysore.*—The most important market for potatoes in Mysore Stat. is Bangalore. The prices in this market, as will be seen from Appendix XIII, are low from January to April ranging from Rs. 2-5-0 to Rs. 2-11-0 per maund. This is due to the local supplies being heavy during this period. From May to July, when the supplies are low, the prices maintain a high level. In August and September they decline again owing to the heavy supplies of the summer crop coming into the market. The prices rise again in October and remain above the annual mean till December.

*Burma.*—In Burma, there is a considerable fluctuation in prices in the course of the marketing season. The prices of potatoes at Myitkyina, where the winter crop is raised, are highest at the beginning of the season in January, when the growers are still busy with harvesting their crop, and in consequence the quantity brought over to the market for sale is small. As the season advances, increasing supplies tend to lower prices. Towards the end of the marketing season, *i.e.*, in the second fortnight of April and May, the supplies fall off, but the prices still remain steady. This may be explained by the fact that during this period, when the heat of summer is at its height, the traders have to allow a big margin for the higher percentage of wastage during transit and so they pay low prices.

The prices in Rangoon as may be seen from Appendix XIII are low from March to September and begin to rise in October, when the supplies decline, and reach their highest level in November when they stand at Rs. 2-14-6 per maund. The rise is due to fall in supplies and also to the disappearance of demand from India for these potatoes (local supplies begin to come into the Indian markets during this month). From January onwards, the prices begin to fall again due to the supplies of the winter crop coming into the market.

From a perusal of the situation in India as a whole, the following important features in the seasonal variation of prices are noticeable :—

(a) Prices in most markets tend to rise from April-June to September and sometimes even up to November. The position is, however, slightly different in South India where the prices of Nilgiri potatoes begin to fall from June and remain below the annual mean till November. During this period, the local supplies are heavy in that part of the country.

(b) Prices are very low in the harvest season which in the plains extends from December to March and in the hills of Northern India from July to October. Thus we see that the price curves for the different markets have almost a similar tendency for the whole year. In the Punjab and Bombay Provinces, the tendency is slightly different. There are two harvest seasons in the plains in these areas and there is thus a double rise and fall in the year.

A striking feature of the seasonal variations in prices, particularly in the assembling markets, is that they tend to become greater with the passing away of the harvest season. For instance, in the case of Patna, Saugor and Jullundur markets, the differences between average maximum and minimum prices have been Re. 0-7-3, 0-6-9 and 0-6-6 per maund during the harvest season, *i.e.*, from January to May (marketing season of the local crop). But later on from June to December, *i.e.*, in the off season, when local produce is not available, the differences have been as high as Rs. 2-0-0, Rs. 3-2-9 and Rs. 2-6-9 per maund respectively. This is so because the supplies are more regular in the season than in the off season. It may also be observed that the difference between the average minimum and maximum prices in consuming markets such as Calcutta, Bombay, Hyderabad (Deccan) and



Cawnpore have been as high as Rs. 2-8-6, Rs. 1-4-3, Rs. 2 15-0 and Rs. 2-13-6 per maund respectively. All this shows that there is a considerable scope for utilising cold storage.

The most significant feature of prices that strikes one's attention is the abnormally low prices in the harvest season. This is so because during this period the supplies in the market increase and depress the prices. The excessive depression at harvest time is also partly due to difficulties of storage and the want of storage facilities in the producing areas (see the Chapter on "Storage") which can be taken advantage of by the cultivators.

#### (4) PRICE DIFFERENCES IN RESPECT OF VARIETY.

As already discussed in the Chapter on "Supply" the different varieties are usually named after the place where they are grown or by their shape or colour. Very often, the produce sold under a particular name in the market as, for example, "Shillong potatoes" or "Rangoon potatoes" consists of a number of different varieties. Prices of potatoes from different sources in the same market do not show much differences as will be seen from the following few examples:—

*Average monthly wholesale prices of Rangoon and Shillong potatoes from 1932 to 1936 at Calcutta.*

(Per maund).

Year.	August.		September.		October.	
	Shillong.	Rangoon.	Shillong.	Rangoon.	Shillong.	Rangoon.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
1932 . .	2 15 0	2 13 0	3 1 0	3 3 0	3 5 0	3 5 0
1933 . .	3 2 0	2 15 0	3 5 0	3 4 0	4 0 0	4 0 0
1934 . .	3 7 0	3 11 0	3 6 0	3 6 0	3 4 0	3 12 0
1935 . .	3 6 0	3 7 0	3 4 0	3 8 0	3 13 0	3 15 0
1936 . .	3 12 0	3 14 0	3 2 0	3 8 0	3 12 0	3 14 0

From the above table it is seen that the usual difference in the prices of the Shillong and Rangoon potatoes has been two to three annas per maund, generally in favour of Rangoon. The maximum difference was eight annas per maund while in certain months the prices were the same in both cases. Similar differences of a minor character in the prices of different varieties grown in Farrukhabad are also noticed as shown in the following table:—

*Average weekly prices of Katuwa and Phulwa varieties in December 1938, at Farrukhabad.*

(Per maund).

Variety.	1st week.	2nd week.	3rd week.	4th week.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Katuwa . . . .	3 4 6	3 0 0	2 8 0	2 6 0
Phulwa . . . .	3 1 0	2 15 0	2 7 0	2 5 0

From these figures it is seen that the prices have varied by one to three and a half annas per maund. The *Katuwa* variety has on the whole fetched better prices than the *Phulwa*, mainly because of its comparatively superior quality and meagre supplies. The same tendency is to be noticed in the Karachi market where the local potatoes grown from Italian seed and "Sialkot potatoes" are sold in the month of June. Their prices as recorded on certain dates are given in the following table :—

*Prices of local (Italian variety) and Sialkot potatoes in Karachi market.*

(Per maund).

Date.	Variety.	Price.	Difference in favour of local.	Percentage excess over Sialkot.
		Rs. A. P.	Rs. A. P.	
11th June 1939	Local . . .	3 4 0	..	..
	Sialkot . . .	3 4 0	..	..
12th June 1939	Local . . .	3 12 0	..	..
	Sialkot . . .	3 12 0	..	..
17th June 1939	Local . . .	4 4 0	0 8 0	13.3
	Sialkot . . .	3 12 0	..	..
19th June 1939	Local . . .	4 8 0	0 12 0	20.0
	Sialkot . . .	3 12 0	..	..
20th June 1939	Local . . .	4 4 0	0 8 0	13.3
	Sialkot . . .	3 12 0	..	..
21st June 1939	Local . . .	4 8 0	0 8 0	12.5
	Sialkot . . .	4 0 0	..	..
23rd June 1939	Local . . .	5 0 0	0 8 0	11.1
	Sialkot . . .	4 8 0	..	..

The maximum difference between the prices of these two types of potatoes was twelve annas per maund, but on many days the difference was only eight annas per maund which may be attributed to the rise and fall in the supplies from different sources. On some dates the prices were the same. The local (Italian) variety, however, fetched higher prices on several days. This may be due to its slightly superior quality.

From these examples it is quite evident that varietal differences exert very little influence on prices. This is so because there is a great confusion about varieties and the consumer does not know which is which. If, however, the quality factors of different varieties were made known to consumers and pure stocks of superior varieties were available, they would certainly fetch higher prices.

(5) COMPARISON OF PRICES IN DIFFERENT MARKETS.

There are great variations in prices in the different markets. The causes for these are many. The distance of the market from the producing areas is an important factor. For longer distances not only are the transport charges higher but the percentage of damage during transit is also high. This tends

to raise the prices. Another contributory factor is the lack of direct contact between markets throughout the country, as a result of which prices differ from place to place.

The monthly average wholesale prices of potatoes in some of the assembling and consuming markets during the years 1933—1937 are given in Appendices XIV to XIV(d). The annual average prices in some of the important markets in 1936 are given in the following table :—

*Annual average wholesale prices of potatoes in some of the assembling and consuming markets in 1936.*

Name of the market.	Price (Per maund)		
	Rs.	A.	P.
<i>Assembling markets—</i>			
Patna . . . . .	2	5	6
Shillong . . . . .	1	13	3
Mettupalaiyam . . . . .	2	8	0
Jullundur . . . . .	2	1	3
Sialkot . . . . .	2	5	3
	<hr/>		
	Average	2	3 6
	<hr/>		
<i>Consuming markets—</i>			
Calcutta . . . . .	2	15	0
Bombay . . . . .	3	13	3
Madras . . . . .	3	3	0
Karachi . . . . .	3	12	9
Hyderabad (Deccan) . . . . .	4	15	6
	<hr/>		
	Average	3	12 0
	<hr/>		
Rangoon . . . . .	2	4	3

The average prices in the assembling markets are naturally lower than in the consuming markets. The difference between the above averages is over Rs. 1-8-0 per maund, so that the wholesale prices in assembling markets are only about 60 per cent of the wholesale prices in consuming markets.

In the case of the assembling markets, the prices vary from place to place. The average prices at Mettupalaiyam, for example, are higher than what they are at most of the other assembling markets. This is due to the fact that large quantities of potatoes are produced in the provinces where these markets are located, whereas Mettupalaiyam is almost a solitary area of the production of potatoes in the South and so the produce of that area is always in great demand, in spite of two crops being harvested in the course of a year. The

prices at Shillong are very low because the local demand in that area is comparatively small. There is, however, considerable demand for this produce in the plains of Bengal, Bihar and parts of the United Provinces. But transport difficulties, on account of the existence of a monopoly, cause the purchasers to offer very low prices for the produce of this area. A vicious circle is introduced, whereby the wider the price agreed between Shillong and Calcutta, the higher the transport charge.

In the consuming markets also, the prices vary from place to place. They are low at Calcutta which is close to some important producing areas such as Hooghly, Burdwan, etc. They are high at Karachi and Hyderabad because of comparatively small local production and long distances from other producing areas. Again, the prices are higher at Bombay than at Madras though in Bombay the producing areas are not so very far off. The local supplies are, however, insufficient and this market has been largely dependent on supplies imported from abroad and moreover the demand in this market is for comparatively better qualities.

Rangoon exports large quantities of potatoes to Calcutta, although the yearly average price at Calcutta is not much higher than that at Rangoon. A study of monthly average prices shows that prices in Calcutta are low from January to May when the local supplies are abundant. In August, September, October and November when potatoes are imported from Burma, the prices in Calcutta are much higher than in other months and higher than those prevailing at Rangoon in those months. In Rangoon, the prices from November onwards show a rise owing to the supply falling off, but in the Calcutta market the prices fall from December due to the supplies of the local crop coming into the market.

A comparison of prices prevailing in different markets shows that in the producing markets of Northern and Southern India they move in reverse directions except in the first three months, *viz.*, January, February and March when they are below the average of the year in all the markets. While the prices in Northern India markets maintain a low level till about May-June, the South Indian markets show a fair improvement in April which is maintained during May and June. In July and August, the prices in Northern India markets improve reaching their peak in September. In October, however, they decline slightly due to an increase in the supplies of hill potatoes, but in November and December, on account of the produce of the winter crop of the plains coming into the market, a sharp fall takes place and the prices go below the mean of the year. In South Indian markets, the prices show a downward tendency during July and August as local supplies in this period become heavy. They, however, begin to rise in September and maintain a high level till December when the prices are again above the mean of the year.

The prices in producing and consuming markets of the respective areas in Northern and Southern India move with a fair degree of sympathy. In Northern India, they keep low during the period from January to May but go above the annual mean from June-July. Thereafter, in both the assembling and consuming markets, the prices rise till October, but in November with the starting of harvesting of the main crop in the plains the prices begin to fall. In Southern India, the prices are low till March and thereafter they begin to rise in both the producing and consuming markets and maintain a high level till July. From then onwards, while the prices in the Northern Indian markets show a rise, they decline in South Indian markets, but from September onwards the prices show a reverse tendency.

## (6) TREND.

The annual average wholesale prices of potatoes for the period 1933 to 37 for some of the important markets are given in Appendix XV and are illustrated in diagram facing this page. It will be seen that the changes in price level from year to year in most cases were no more than a few annas. The trend of prices in some of the important markets is discussed below.

In Nainital, the fluctuations in the annual average prices have been rather small. In 1934, the average price for the year was Rs. 2-15-9 per maund. In 1935, it went up to Rs. 3-2-9 but again declined to Rs. 2-9-3 in 1936. In the succeeding year it remained at Rs. 2-6-6.

In Cawnpore, the average price per maund was Rs. 3-7-0 in 1933, but it declined to Rs. 2-14-3 in the succeeding year. In 1935, it rose again to Rs. 2-15-0. In 1936, there was a slight fall but in 1937, it increased slightly and amounted to Rs. 3-0-9. Thus from 1934 onwards it has shown a very slight upward tendency. The maximum rise in prices from 1934 to 1937 was by Re. 0-2-6 per maund.

In Calcutta, the price per maund was Rs. 2-7-9 in 1933. In the succeeding two years it gradually increased and reached a maximum of Rs. 3-0-9. In 1936, it went down to Rs. 2-15-0 and in the following year there was a further fall when the price stood at Rs. 2-14-9.

In Shillong, the price has shown considerable fluctuations. The annual average price per maund was Rs. 1-11-3 in 1934. It rose to Rs. 2-2-3 in the succeeding year, showing an increase of 7 annas per maund. But it decreased to Rs. 1-13-3 in 1936 and again rose to Rs. 2-10-0 in 1937. The wide fluctuations were mainly due to variations in the local production.

In Bombay, the average price was Rs. 3-9-0 per maund in 1933 and Rs. 3-13-9 per maund in 1934. There was a fall of about 5 annas per maund in 1935 but the price rose again to Rs. 3-13-3 per maund in the following year.

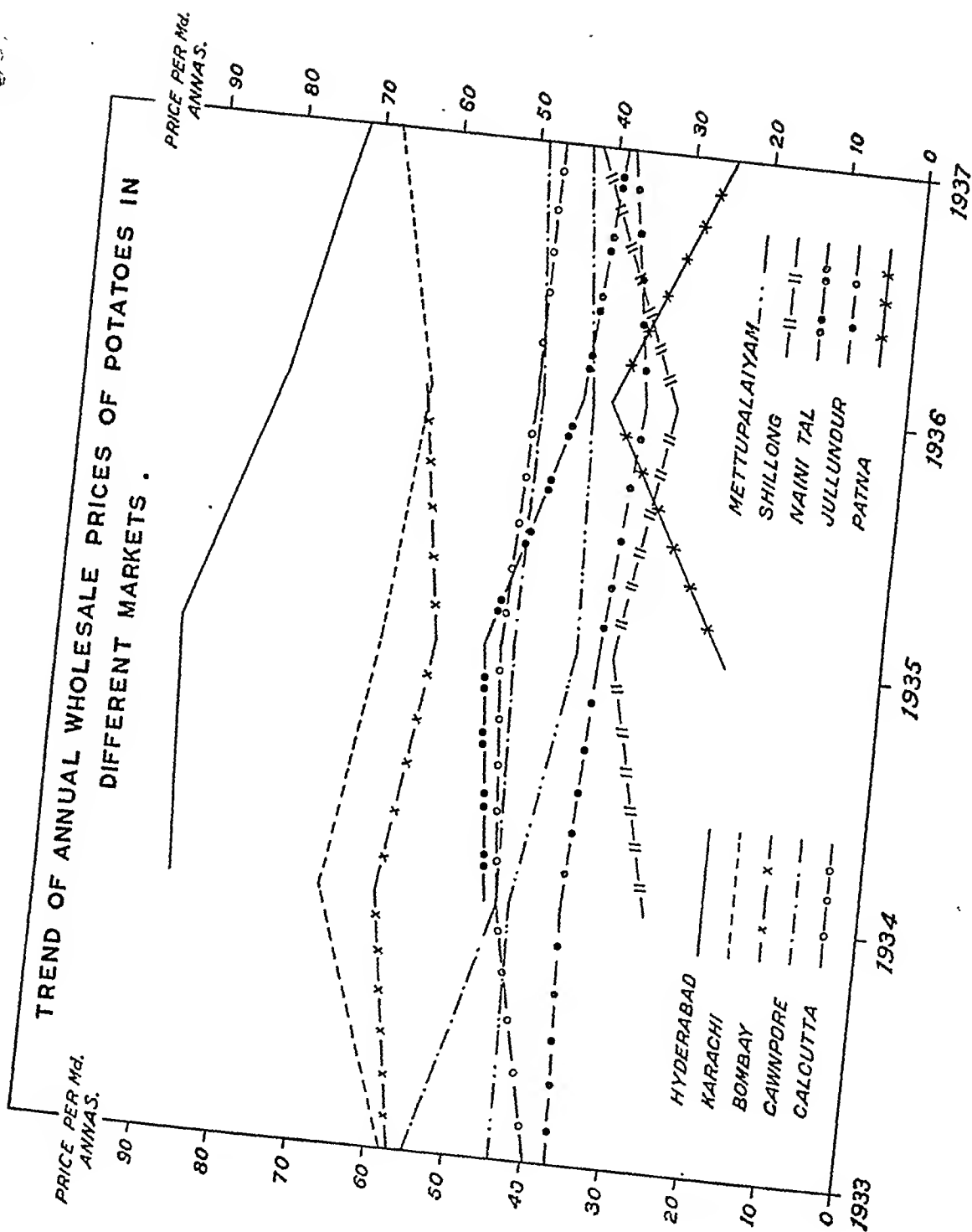
In Mettupalaiyam, fluctuations in the annual average price were not very great. The price was more or less the same in 1933 and 1934. There was a fall of about 5 annas per maund in 1935. Almost the same level was maintained in 1936, but there was a slight rise again in 1937.

In the Jullundur and Sialkot markets, the price has shown small fluctuations from year to year. In the former market, it varied between Rs. 2-1-3 and Rs. 2-6-0 and in the latter between Rs. 2-5-3 and Rs. 2-8-6 per maund. Thus the maximum variation did not exceed 5 annas per maund.

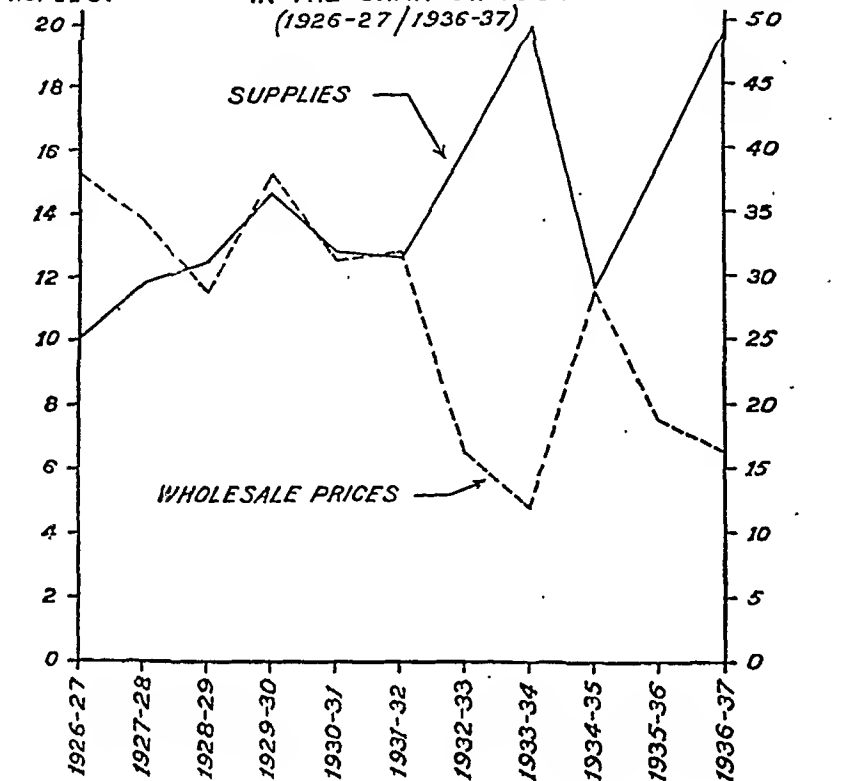
In Karachi, the average price per maund was Rs. 3-10-0 in 1933. It rose to Rs. 4-5-0 in 1934 but gradually declined in the succeeding two years to Rs. 4 and Rs. 3-12-9 respectively. In 1937, it again went up to Rs. 4-3-9. Thus the price showed fairly wide variations during this period. This might be due to fluctuations in the home production consequent upon variations in the area under potatoes in the Malir tract.

In Hyderabad (Deccan) the price per maund of potatoes was Rs. 5-8-3 in 1934. There was an increase of an anna and a half in 1935 but the price suddenly dropped to Rs. 4-15-6 in 1936, thus recording a fall of about 10 annas per maund. In the following year it decreased further by another Re. 0-7-9.

From the above account it is clear that the price level in different markets has not shown any consistent trend owing to the predominance of local causes. There is, however, a close relationship between the trend of prices at the important consuming and assembling markets. The prices at these two sets of



**TREND OF WHOLESALE PRICES OF POTATOES AT AUNGBAN & THE  
PRICE PER 100 VISS. TOTAL AVAILABLE SUPPLY  
RUPEES. IN THE SHAN STATES.  
(1926-27/1936-37)**

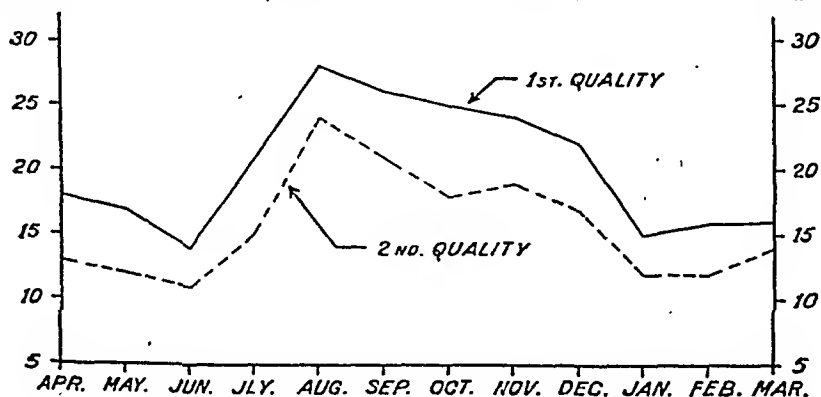


**SEASONAL VARIATIONS IN RETAIL PRICES**

PRICE PER SEER.  
PIES.

**OF POTATOES AT LAHORE.**  
(AVERAGE - 1932-33/1936-37)

PRICE PER SEER.  
PIES.



markets move in close correspondence with each other though the corresponding rises or falls are not always proportionate. We find the above tendency in operation when we compare the prices at Calcutta, an important consuming market, with those at Shillong and Rangoon which serve as sources of supply for the former. There appears to be a sympathetic movement from year to year between the prices at Shillong and Calcutta although the rise and fall have not been in the same proportion in both markets. The connection is obscured by the fact that the Commercial Carrying Company at Shillong, which has the monopoly of road transport, varies its charges from day to day according to Calcutta prices. For example, if Calcutta prices rise, rates are increased so as to leave the Shillong prices more or less unaffected.

A similar tendency is noticeable between the price levels at Mettupalaiyam, a large assembling centre, on the one hand, and Madras and Bombay, the two big consuming centres on the other. Prices at Mettupalaiyam during the period 1933-36 followed very closely the prices at Madras. The difference between the average highest and lowest prices during this period at Mettupalaiyam was Rs. 1-0-9 and at Madras Rs. 1-3-0 per maund.

**Burma.**—There has been a considerable fluctuation in prices from year to year, depending upon the extent of home production and the demand in the Calcutta market. A statement showing the total available supply (carried by rail) of the produce of the Shan States and the weighted average price per 100 viss at Aungban from 1926-27 to 1936-37 is given below (see also diagram facing page 67) :—

*Average wholesale prices per 100 viss of potatoes at Aungban and the total available supply of the Shan States.*

Year.	Total available supply. (In tons).	Average price. (Per 100 viss).
		Rs. A. P.
1926-27 . . . . .	25,245	15 4 0
1927-28 . . . . .	29,711	13 12 0
1928-29 . . . . .	31,294	11 8 0
1929-30 . . . . .	36,508	15 4 0
1930-31 . . . . .	32,029	12 8 0
1931-32 . . . . .	31,460	12 12 0
1932-33 . . . . .	40,227	6 8 0
1933-34 . . . . .	49,775	4 12 0
1934-35 . . . . .	29,187	11 8 0
1935-36 . . . . .	38,115	7 8 0
1936-37 . . . . .	49,370	6 8 0



It is clear from the preceding table that except in the year 1929-30 and 1930-31, there has been a definite relationship between the available supplies and the prevailing prices during the entire period. With an increase in supply, there has usually been a fall in the prices and *vice versa*. The years 1929-30 and 1930-31 were, however, abnormal. With an increase in the supply from 25,245 tons in 1926-27 to 31,294 tons in 1928-29, the price per 100 viss dropped from Rs. 15-4-0 to Rs. 11-8-0. The next two years were abnormal as the prices, in spite of heavy supplies, remained high. The slump in agricultural prices generally and the increase in the supplies from 31,460 tons in 1931-32 to 49,775 tons in 1933-34 appear to have caused a severe drop in the price from Rs. 12-12-0 to Rs. 4-12-0. In 1934-35, the prices rose again to Rs. 11-8-0 but declined in 1935-36 to Rs. 7-8-0 and in 1936-37 to Rs. 6-8-0 per 100 viss. The prices after 1932-33 have not followed any definite trend but appear to have been affected by local production and the supplies available from other sources at the Calcutta market.

## B.—Retail prices.

### (1) GENERAL.

No systematic records regarding retail prices exist anywhere. Some local bodies, e.g., municipalities and cantonment boards, do maintain a sort of record of retail prices, but these records are defective and cannot be relied upon. These bodies usually issue the prices a week or a fortnight in advance and the figures are ordinarily based on prices then prevailing. They are never, therefore, in harmony with the day to day conditions of the retail market. The only useful purpose that these records may serve is to indicate the general conditions in the trade.

As the retail trade is not subject to any systematic control, the retailers usually charge what they can. The most important single factor, however, is the purchase price of the retailer, who adjusts his price not only according to supply and demand but also according to the quality of the produce and the purchasing capacity of the people who buy from him.

The consumption of potatoes is mainly confined to urban areas. The retail prices in the same place may vary from one part of the city to another. Retail stall keepers catering for the well-to-do citizens usually charge more than those situated in poorer localities. For instance, in Sir Stewart Hogg Market at Calcutta, which caters for Europeans and other classes, the prices are always higher than in other Calcutta markets. Hawkers, who do not have to maintain any establishment, charge lower prices. In the absence of fixed prices or standards, bargaining and higgling are a common feature of the retail trade.

### (2) SEASONAL VARIATION AND TREND.

The seasonal fluctuations in the retail prices correspond to similar fluctuations in the wholesale prices. They are generally low during the harvest season and begin to rise with its passing away till they reach their peak during the period September-November. This tendency may be noted in the retail prices of potatoes at Lahore. The prices for this market for the period 1932-33 to 1936-37 are given in Appendix XVI. The average monthly

prices for this period are given in the following table (see also diagram facing page 67) :—

*Average monthly retail prices (per seer) of potatoes at Lahore.  
(1932-33 to 1936-37.)*

Month.	Quality.	Price.
		A. P.
April . . . . .	1st quality 2nd quality	1 6 1 0
May . . . . .	1st quality 2nd quality	1 3 1 0
June . . . . .	1st quality 2nd quality	1 3 1 0
July . . . . .	1st quality 2nd quality	1 9 1 3
August . . . . .	1st quality 2nd quality	2 3 2 0
September . . . . .	1st quality 2nd quality	2 3 1 9
October . . . . .	1st quality 2nd quality	2 0 1 6
November. . . . .	1st quality 2nd quality	2 0 1 6
December . . . . .	1st quality 2nd quality	1 9 1 6
January . . . . .	1st quality 2nd quality	1 3 1 0
February . . . . .	1st quality 2nd quality	1 6 1 0
March . . . . .	1st quality 2nd quality	1 3 1 0
Average . . . . .	1st quality 2nd quality	1 9 1 3

It will be seen that the prices are low from January to June and are high during the rest of the year. In August and September, they are nearly double of what they are in January to March. It may further be seen that the prices during the quinquennium 1932-33 to 1936-37 have remained more or less steady. A similar tendency has been observed in the Calcutta markets where the prices are low in January to March and rise as the season advances.

**C.—Customary units of price quotation.**

It is unfortunate that there are no uniform standards for price quotations. In some markets, the prices are quoted on a maund basis and in others on a bag basis. As will be shown below, the maund and the capacity of a bag

varies from place to place and it is difficult to compare the prices of different markets. This is a source of great inconvenience and annoyance to all concerned.

In the Punjab, the unit of weight in the wholesale trade is generally a maund which varies in its capacity from market to market. In some markets, it is equal to 40 seers while in others 50 seers. Different maunds may be used in the same market for the produce from different sources. In Rawalpindi, for example, the maund consists of  $51\frac{1}{2}$  seers for the Kashmir produce and  $52\frac{1}{2}$  seers for the Murree produce.

Again, a maund may consist of 43 seers during the period of abundant supplies and of 42 seers at the beginning and end of the season. The wholesalers use a maund of 40 seers when selling goods to retailers. For the imported produce, a maund of  $40\frac{1}{4}$  seers is in use throughout the province. *Dhari* or *dharan* (5 seers) is the most common unit of weight when the wholesalers sell the produce to retailers.

The retail prices are generally quoted on the basis of a seer of 16 chhataks. A desirable feature in almost all the markets in the Punjab is the use of *pucca* (standard) weights for weighing the produce.

In Bengal, the customary unit of quoting wholesale prices is a maund of 40 seers. In almost all the markets an excess of one seer per maund is allowed as a *dolati*. In Dacca, however, a maund of  $43\frac{1}{2}$  seers is used in the case of potatoes imported from Bihar. In retail trade, a seer consists of 80 tolas. But in some parts it varies from 60 to 90 tolas.

In Assam, the customary unit of price quotations is a maund of  $82\frac{2}{7}$  lb. for wholesale and a seer of 80 tolas for retail transaction.

In Madras, the unit for wholesale transactions at Mettupalaiyam consists of four baskets of 50 lb. each while purchasing the produce from growers and a bag of 190 lb. net for export trade. The difference in weight is supposed to cover the loss in weight in handling and storage. In the retail trade, the customary unit of sale is a viss of 3 lb.

In the Central Provinces, the unit of price quotation for wholesale transactions varies with the locality and type of stock. For the home grown produce, it is a maund of 40 seers or a *gon* of 3 maunds and for seed potatoes a maund of 40 seers known as *zalli* (basket load). The unit for the imported produce for consumption is a maund of 40 seers or a bag weighing from two maunds to two maunds and sixteen seers.

In Bombay, a very large number of units prevails in the different markets for wholesale price quotations. They are given in the following table :—

*Units of price quotations used in the Bombay Presidency.*

Name of the Market.	Units of quotations.
Bombay . . . . .	A maund of 28 lb.
Poona . . . . .	A <i>palla</i> of 155 seers. (Each seer being equal to 80 tolas).
Manchar . . . . .	A heap on auction.
Wathar and Koregaon . . . . .	<i>Khandi</i> of 3 bags or 21 mds. of 13 srs. each. (Each seer being equal to 80 tolas).
Belgaum, Dharwar and Kolhapur . . . . .	A maund of 28 lb.
Hubli . . . . .	A maund of 25 lb.
Ahmedabad and Boriavi . . . . .	A maund of 42 seers. (Each seer being equal to 40 tolas).
Nasik and Deolali . . . . .	A bag roughly of 160 to 200 lb.

The Government of Bombay enacted the Weights and Measures Act of 1936 according to which the unit for retail transaction in most of the towns and cities is either a pound or a seer of 80 tolas. But the old weights are still current in some places. Auction sales of whole heaps (as at Manchar) and of bags without weighing are in vogue in villages. This introduces an element of uncertainty and goes invariably against the interests of the ignorant cultivator.

#### D.—Weights and measures.

The necessity for the standardisation of weights is obvious. The diversity of weights and measures is appalling.

The different weights and measures prevailing in the country lend themselves easily to dishonest and fraudulent practices by the unscrupulous merchants. In agriculture, the whole brunt is borne by the ignorant and illiterate cultivators. The existence of different standards is a great hindrance in the development of organised trading as it necessitates a good deal of time and labour for calculation. Moreover, the price statistics from different markets cannot be readily compared.

In almost all the provinces, weights and not measures are in customary use in the potato trade excepting in the Assam Hills where a basket is also used. The most common weight used throughout the country is the maund of 82 2/7 lb. This is known as the railway maund or the Bengal maund and is used on all the railways and at the ports and in many of the large trade centres. It is common in the rural areas in the eastern parts of the Punjab, round about Delhi, in the western districts of the United Provinces, and since the enforcement of the Bombay Weights and Measures Act of 1936, in most of the markets of Bombay and Sind. But numerous other standards are also in use in different parts of these provinces. (See plate facing page 72).

In the Punjab, the maund is the customary weight, but it has different meanings in different markets as will be seen from the statement below :—

Markets.	Weight of maund in seers.
1. Rawalpindi . . . . .	51½ to 52½
2. Wazirabad . . . . .	51½
3. Lahore, Amritsar, Jullundur, Ludhiana, Sialkot, Karnal, Ambala, Gujrat and Jhelum . . . . .	50
4. Ferozepur . . . . .	40½ to 43
5. Gujranwala, Montgomery, Multan, Simla, Campbellpur, Muzzaffargarh, Leiah and Gujar Khan . . . . .	42
6. Rampur . . . . .	41
7. Kalka . . . . .	40½
8. Lyallpur, Mianwali, Rohtak, Panipat, Gurgaon, Kun- dian and Lalsmusa . . . . .	40

*Dhari* or *dharan* (5 seers) is the common unit of weight.

In Bengal, there are various weights in use in different parts of the province. In North Bengal, a seer may be 60, 80, 82 5/8, 84, 84 5/8 or 90 tolas. In the districts of Tipperah, Noakhali and Chittagong, a seer is 80, 80 5/8 and 84 5/8 tolas respectively.

In Assam, in the distant rural area of Khasi and Jaintia Hills, one maund of potatoes is measured in a basket and not weighed in a balance. A few seers are always taken gratis for every maund of potatoes purchased by the traders.

In Madras, there is a great diversity in the weights in current use. For example, a seer consists of 24 tolas at Vizagapatam, 21 tolas at Anantapur, 24 tolas in South Kanara and 84 tolas at Bellary. The common standard is, however, a maund of 25 lb. or 8 viss.

Bombay has been fairly successful in co-ordinating the various standards of weights and measures in the presidency since the passing of the Bombay Weights and Measures Act of 1936. According to this Act, the unit of retail sales in most of the towns is either a pound or a seer of 80 tolas. But as the Act has been recently introduced some of the weights previously in use are still current in some places as shown below :—

Bombay . . . . .	A pound or a seer of 28 tolas.
Hubli and Kumta . . . . .	A seer of 20 tolas.
Ratnagiri . . . . .	One pound.
Sinal and Ahmedabad . . . . .	A seer of 40 tolas.

In Sind, the Bengal or the railway maund (82 2/7 lb.) with its usual sub-multiples is in use throughout the province.

In Orissa, potatoes are sold by the standard seer of 80 tolas, though the local weights of different denominations, which vary from place to place, are still being freely used in the rural areas.

In the Indian States, the same chaotic conditions are noticeable. Some important States such as Hyderabad (Deccan) and Mysore have, however, adopted certain standard weights. In Hyderabad (Deccan) a maund of 12 seers is in common use and iron standard seers are employed. When the produce is sold to the wholesale dealers, stone weights are also used which are supposed to be equivalent to iron weights. In Mysore, the Weights and Measures Regulation of 1927 defines a maund as equal to 24 lb. or 40 seers, each seer being equal to 24 tolas.

The Municipal Act, 1898, of Burma lays down that the standard weight within the limits of a municipality shall be the pound. The viss shall be a weight equal to 3.6 times the standard pound or 140 tolas. The viss is subdivided into 100 equal parts known in Burma as *kyat* or *gyat* or sometimes simply as *tha* (piece).

Most of the weights used in Northern India, particularly in the United Provinces, are manufactured in the foundries of Agra and Cawnpore. The weights commonly used in North and Central India and Bombay are manufactured from cast-iron, and are stamped with the units they represent. Any piece of iron stone or brick is, however, pressed into service as occasion requires.

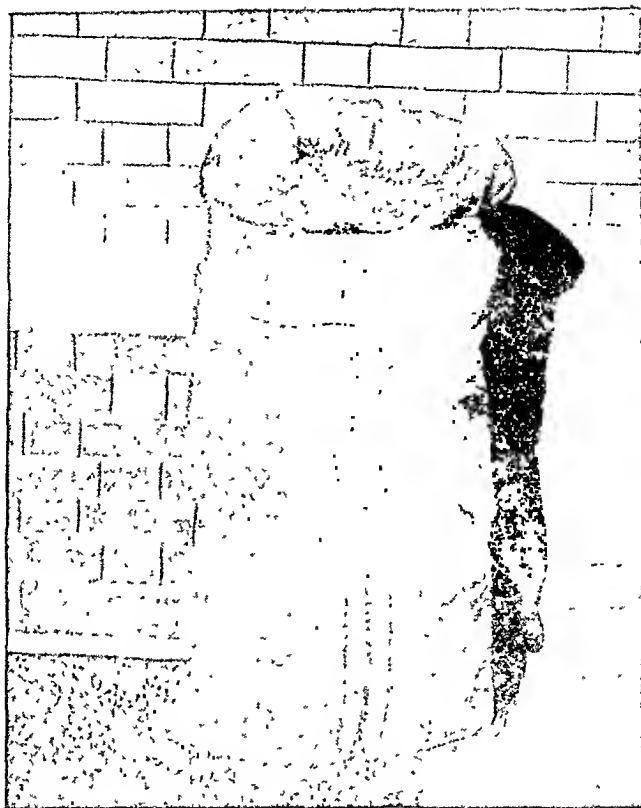
The great diversity in weights in different parts of the country causes considerable confusion. The standardisation of weights is an urgent necessity and should be one of the main steps taken for the improvement of agricultural



MEASURES USED FOR POTATOES.



HARVESTING OF POTATOES IN PROGRESS IN SABARMATI.



EXTRA PIECE OF GUNNY CLOTH TO ACCOMMODATE MORE POTATOES.



JHAU BASKETS USED FOR PACKING SEED POTATOES.

marketing. The passing of the Standards of Weight Act (1939) by the Central Government makes uniform progress possible throughout the whole of India. It now remains for provinces and States to take necessary active measures as soon as possible.

#### E.—The price spread from consumer to producer.

Potatoes after leaving the producer's holding pass through several agencies before they reach the consumer. Every one of the intermediaries through whom the goods pass makes a charge for the services rendered by him. The important variable factor in the cost of distribution is railway freight which not only varies according to distance but also as to whether any special freight rate is allowed between the different stations. The cost of distribution increases according to the number of times the commodity changes hands before it reaches the final consumer.

It is worthwhile enquiring as to what share of the price paid by the consumer is going to the producer and to the various agencies engaged in the distribution of potatoes. A few typical examples in this connection are given below (please also see diagram facing page 74).

##### *Example No. 1.*

A maund of potatoes produced in the Nilgiri Hills (Madras) and sold to the consumers at Madura.

	Rs.	A.	P.	Percentage.
1. Producer's net selling price . . . . .	2	4	3	54.8
2. Lorry hire from producer's holding to assembling market .	0	4	1	6.2
3. Handling charges at Mettupalaiyam . . . . .	0	3	9	5.7
4. Transport and handling charges at destination—				
(a) Transport . . . . .	0	7	4	
(b) Handling at destination . . . . .	0	0	11	
				12.5
5. Wholesaler's margin . . . . .	0	6	11	10.4
6. Retailer's margin . . . . .	0	6	11	10.4
Consumer's price . . . . .	4	2	2	100.0

##### *Example No. 2.*

A maund of potatoes produced in the neighbourhood of Malir (Sind) and sold to the consumers at Karachi.

	Rs.	A.	P.	Percentage.
1. Producer's net selling price . . . . .	3	8	0	70.0
2. Transport charges . . . . .	0	4	0	5.0
3. Market charges . . . . .	0	8	0	10.0
4. Retailer's margin . . . . .	0	12	0	15.0
Consumer's price . . . . .	5	0	0	100.0



*Example No. 3.*

A maund of potatoes produced in Nilgiris (Madras) and sold to the consumers at Mangalore.

	Rs.	A.	P.	Percentage.
1. Producer's net selling price . . . . .	2	3	5	51.5
2. Lorry hire from producer's holding to assembling market .	0	4	1	5.9
3. Handling charges at Mettupalaiyam . . . . .	0	3	9	5.4
4. Transport and handling charges.—				
(a) Transport charges . . . . .	0	11	3	
(b) Handling charges at destination . . . . .	0	0	11	
				17.7
5. Wholesaler's margin . . . . .	0	6	6	9.4
6. Retailer's margin . . . . .	0	6	11	10.1
Consumer's price . . . . .	4	4	10	100.0

*Example No. 4.*

A maund of potatoes produced at Sultan Bihan (Sind) and sold to consumers at Hyderabad (Sind).

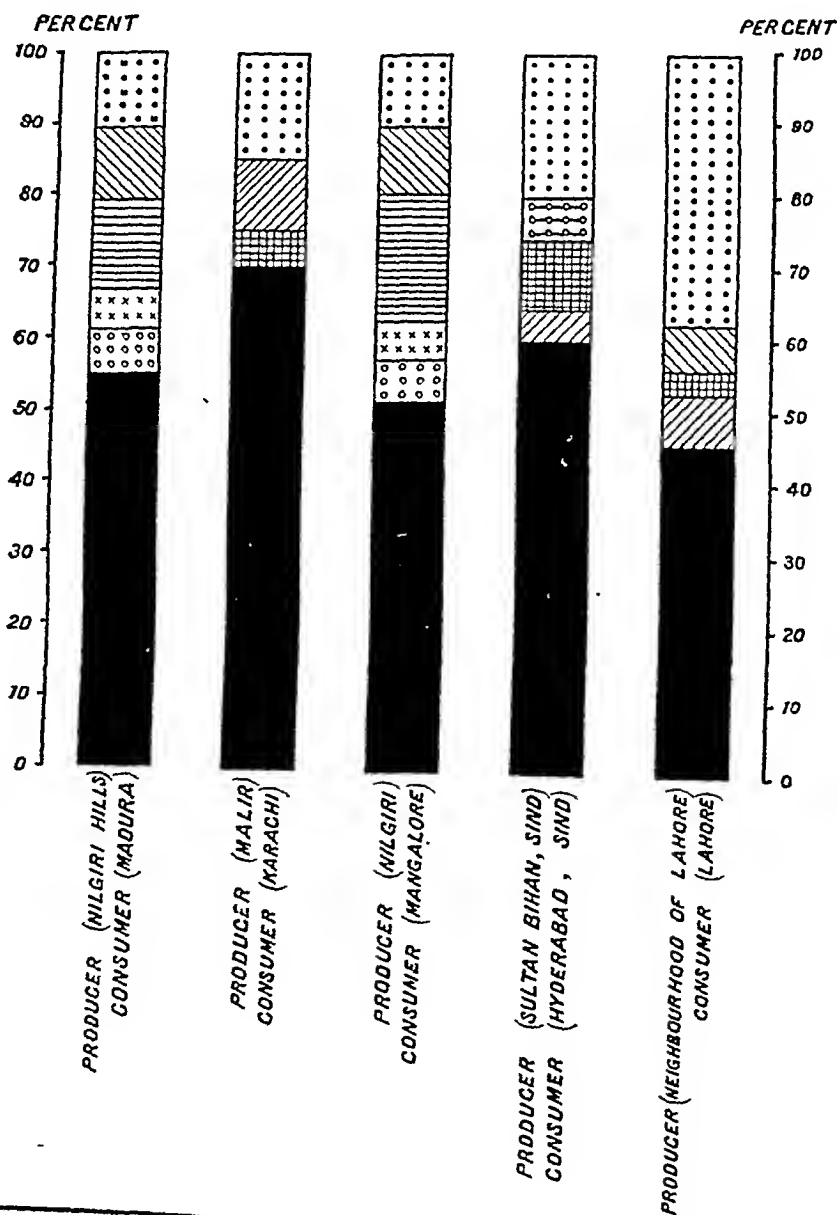
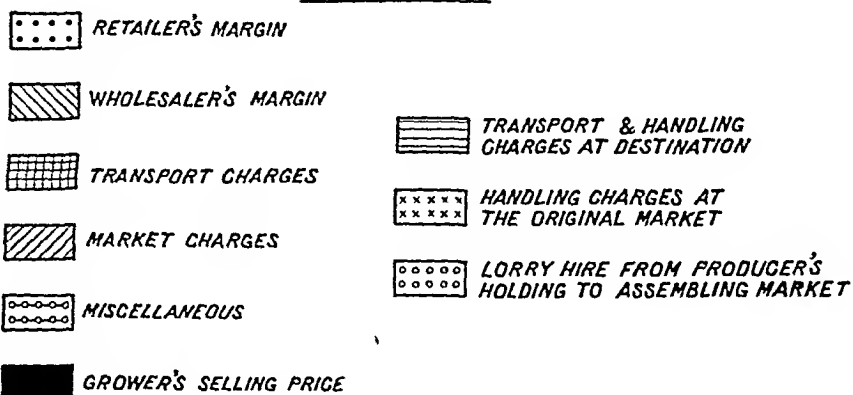
	Rs.	A.	P.	Percentage.
1. Grower's selling price . . . . .	3	12	0	60.0
2. Market charges . . . . .	0	4	6	4.5
3. Transport charges . . . . .	0	9	6	9.5
4. Miscellaneous charges . . . . .	0	6	0	6.0
5. Retailer's margin . . . . .	1	4	0	20.0
Consumer's price . . . . .	6	4	0	100.0

*Example No. 5.*

A maund of potatoes produced in the neighbourhood of Lahore and sold to consumers at Lahore.

	Rs.	A.	P.	Percentage.
1. Grower's net selling price . . . . .	1	1	3	45.4
2. Market charges . . . . .	0	2	10	7.4
3. Transport charges . . . . .	0	1	2	3.1
4. Wholesaler's margin . . . . .	0	2	6	6.6
5. Retailer's margin . . . . .	0	14	3	37.5
Consumer's price . . . . .	2	6	0	100.0

From the above few examples, it will be seen that the producer's share in the price paid by the consumer varies from 45.4 per cent to 70.0 per cent. The rest goes to the intermediaries. The share

**PRICE SPREAD FROM CONSUMER TO PRODUCER**REFERENCES



of transport agencies depends on the distance between the consuming and the assembling markets. For instance, in the case of produce of Malir area sold in Karachi, the share of transport is very small while in the case of the produce of Nilgiri area sold in distant markets, such as Madura and Mangalore, the share of transport agencies is comparatively higher. The retailer usually gets 10 to 15 per cent and sometimes as high as 37 per cent as in the case of Lahore. Thus it is evident that a fairly large proportion of the price paid by the consumer goes to the intermediate agencies engaged in the process of distribution of potatoes. Generally speaking, the grower gets about 50 per cent of the price paid by the consumer. There is no doubt that a producer must pay for the marketing of his produce, but the charges that he is called upon to meet should not be disproportionately high as they are at present. There is considerable scope for reducing the number of intermediaries and their charges. Arrangements for bulk transport would reduce the cost of carriage. The existence of reliable sales agencies would result in narrowing down still further the margin between the price paid by the consumer and that realized by the producer. An extension of market news service is also a necessity to keep the cultivator informed of the prices ruling in various markets so that he may be able to dispose of his produce at the most suitable place and at the best possible terms.

#### F.—Market intelligence.

There is a general complaint that the producers do not get fair prices for their produce on account of their ignorance of market conditions. The absence of an organised system of market intelligence is mainly responsible for this exploitation of the cultivator by the middlemen and the merchants. The condition of the potato markets in this respect is most deplorable. There is hardly any market in India where there is a regular organisation for systematic recording of arrivals and stocks or of wholesale and retail prices of potatoes.

The cultivators in the rural areas get their information about market conditions from co-villagers who have been to an *arhatiya* or a dealer, or from itinerant merchants who visit producing areas for making purchases. It is quite obvious that such information cannot always be regarded as trustworthy. Some intelligent cultivators can, however, sometimes make out very accurately the market conditions from the terms offered by the traders at the farms.

Merchants in producing centres often visit the area of production and get a fairly correct idea as to what the volume of production is going to be. They also keep themselves in touch with the merchants in consuming areas and with their fellow traders in other parts of the province. The commission agents in the main consuming markets furnish information to the merchants in the assembling markets by postal correspondence, and, in cases of urgency, by telegrams and telephones. Business is conducted mainly on shrewd guesses without the commission agents committing themselves in any way about prices. In fact most of their postal communications to their clients regarding marketing conditions end with the rather amusing statement—“and for to-morrow God knows”.

An important firm of potato dealers in Simla publishes a daily market report in English and Hindi for the use of its customers (a copy of the report published by it on 21st November 1936 is given in Appendix XVII). Similarly, a Kalka firm supplies information about prices of potatoes to its customers on postcards printed in Urdu.

The Simla firm referred to above also publishes another type of report which is intended more for advertisement than for information. A comparison of the quality of the potatoes grown in different hills in India is made in this report. The heights of the hills whose produce compete with that of Simla are given and emphasis is laid on the point that the higher the altitude the superior the produce. It is interesting to note that in the case of the produce of other hills, the altitudes of the assembling markets, *e.g.*, Haldwani and Gauhati, where the produce of Kumaon and Khasi and Jaintia Hills respectively is assembled are given while in the case of Simla produce the height of the growing areas is shown. A copy of such a report is given in Appendix XVIII.

The United Provinces Fruit Development Board has started, since 1937, a fortnightly bulletin for giving information about stocks, arrivals, wholesale and retail prices and forecasts of demand for some fruits and vegetables including potatoes for some selected markets in the province. This publication serves a useful purpose.

In some parts of the Punjab, as already pointed out, the revenue authorities maintain records of the wholesale prices of potatoes. But a great difference between these prices and those obtained from merchants of the same markets has sometimes been noticed. In the case of the Ferozepur market, for example, the average price for the year 1936-37 calculated from the records of the revenue authorities and from the account books of the merchants was found to be Rs. 2-13-3 and Rs. 2-7-3 per maund respectively. A similar discrepancy was noticed in the average price calculated for the month of November in the same year from these two sources, the prices being Rs. 3-4-0 and Rs. 2-12-9 per maund respectively. Such differences in prices are common in the case of other markets also. The official system for collecting the information does not seem to be efficient. It is desirable that greater attention should be paid to this work by those entrusted with it.

Up till now, the daily newspapers supplying information about agricultural produce have neglected the potato trade. In view of the increasing importance of this commodity, it is desirable that they should devote some space to it in future.

The radio is another agency through which market news can be disseminated to different parts of the country. Though it is a recent innovation and its range is rather limited in the country at present it is full of potentialities. If receiving sets were supplied to the rural areas, the radio would prove a very useful source of information to the cultivating classes. Large business men have provided themselves with receiving sets and attend to the commercial news bulletin broadcast by the All-India Radio from Delhi, Calcutta and Bombay. The potato trade, therefore, deserves a place in this bulletin, and arrangements should be made to broadcast the daily or weekly prices of potatoes and the general tendencies in the trade as a whole. This would prove very useful to the ignorant cultivators.

It is, however, necessary that some systematic arrangements should be made to ascertain and publish information regarding stocks, arrivals, daily prices and the amount of business done in various markets and their general tendencies. To accomplish this it seems desirable to have a separate organisation for collection of market information about agricultural commodities including potatoes and its dissemination through the press, the radio and other agencies. The information may also be sent to the marketing staff and selected commission agents in different markets who should see that it is posted in their respective markets at prominent places.

### INTER-CHAPTER THREE.

The study of potato prices is rendered difficult by the absence of reliable data covering a sufficiently long period. Government publications of the various provinces have paid scanty attention to this commodity. Only in a few places do we find any mention of potato prices in Government records; for example, in some district headquarters of the Punjab, local revenue officers maintain records of the prices of potato mainly for the benefit of other Government departments such as jails, etc. But even this is not done in a systematic manner: while in some places only wholesale prices are given, in others there are only retail ones. Again, as these records are not published, neither producers nor merchants nor consumers can derive any benefit from them.

During the harvest season, the supply of potatoes is plentiful and prices are as a rule low, but they vary very much from place to place and from year to year. They even vary during the same season, being low when the season is in full swing and high in the beginning and towards the end of it. The average price is generally highest in December, *i.e.*, in the beginning of the season when supplies are small and the demand for fresh produce is great. Prices fall considerably in January and come down still further in February, being about 35 to 60 per cent less than the average price ruling in December. This happens because supplies are relatively more abundant in February and the demand is not as great as in December. Prices rise slightly in March when the season draws to a close.

Seasonal fluctuation in prices is of course common to all agricultural commodities, but this is particularly noticeable in the case of potatoes, which under Indian conditions cannot be conveniently stored on the farm on account of their perishable nature. Seasonal fluctuations are very great at Agra and Cawnpore. Very high prices are realised in November and very low ones in February, March and April. In the Patna and Darbhanga markets, the highest average prices obtain in August and are 73 per cent and 61 per cent higher than the respective annual means, and the lowest prices occur in February and March and are 45 and 33 per cent less. In Bengal also the same tendency is noticeable. In the Bombay market, prices are low from January to April. At Mettupalaiyam (Madras), the main assembling market for Nilgiri potatoes, prices are highest in April. In the Madras province as a whole, prices rise steadily from the month of April. In June they are usually highest,

but from July onwards prices begin to decline and are pretty low during August and September, mainly due to the new crop of Nilgiri Hills coming into the market. Prices recover slowly after September and continue to rise till December. In the Punjab, the widest range of variation occurs at Ferozepur, the highest point being reached in October and the lowest in June. The difference between maximum and minimum prices in this centre amounts to Rs. 2-14-3 per maund. Taking the province as a whole, prices move at the various important markets more or less simultaneously. From about the middle of July to the end of November, local supplies in the plains are not available : the demand has to be met by importing potatoes from other provinces and from the hills, and consequently prices remain rather high during this period.

Taking India as a whole, it is noticed that prices in most markets tend to rise from April-June to September and sometimes even till November. They are very low during the harvest season which in the plains extends from December to March and in the hills of Northern India from July to October. A striking feature of the seasonal variations in prices, particularly in the assembling markets, is that fluctuations tend to become greater with the passing away of the harvest season. This happens because supplies are more regular during the season than in the off-season. It may also be observed that the difference between the average minimum and maximum prices in consuming markets like Calcutta, Bombay, Hyderabad (Deccan) and Cawnpore has been as high as Rs. 2-8-6, Rs. 1-4-3, Rs. 2-15-0 and Rs. 2-13-6 per maund respectively. The most significant fact is that during the harvest season prices of potatoes become abnormally low owing to super-abundance of supplies in the market. Difficulties of storage and absence of storage facilities in the producing areas also help to depress prices during this period.

Differences in variety exert very little influence on the prices of potatoes, because at present the consumer knows very little about varieties. If, however, the qualities of different kinds of potatoes were made known to consumers and pure stocks of superior varieties were made available, the latter would certainly fetch higher prices.

The prices of potatoes obtained from different sources in the same market do not show much difference but they vary considerably in different markets. This is due mainly to the distance of markets from producing areas and the absence of direct contact between markets throughout the country. Average

prices in the assembling markets are lower than in the consuming markets by over Rs. 1-8 per maund, so that the wholesale prices in the former are only about 60 per cent of those in the latter. In the consuming markets also, prices vary from place to place. They are low in Calcutta which is close to important producing areas like Hooghly, Burdwan, etc., and high at Karachi and Hyderabad because of comparatively small local production and long distances from other producing areas. Again, prices are higher in Bombay than in Madras, because notwithstanding the closeness of producing areas in Bombay, supplies are insufficient and the Bombay market has to depend largely on imported supplies from abroad.

A comparison of the prices prevailing in different markets shows that in the producing markets of Northern India and Southern India, they move in the reverse directions except during the first three months, *viz.*, January, February and March, when they are below the average of the year in all the markets. But while till about May-June, prices in North Indian markets remain low, in the South Indian markets a fair improvement is registered in April and this is maintained during May and June. In July and August, prices in North Indian markets improve, reaching their peak in September. In October, however, they decline slightly due to increase in the supplies of hill potatoes, and in November and December, on account of the produce of the winter crop of the plains coming into the market, a sharp fall takes place and prices go below the mean of the year. In South Indian markets, on the other hand, prices show a downward tendency during July and August owing to large local supplies, but begin to rise in September and maintain a high level till December when prices are again above the mean of the year.

A study of the annual average prices of potatoes in the more important markets shows that changes in price level from year to year are in most cases no more than a few annas. Another feature is that although prices in the different markets do not show any consistent trend owing to the predominance of local causes, in the important consuming and assembling markets, they move in close correspondence with each other. The above tendency is noticed in comparing the prices prevailing in Calcutta, an important consuming market, with those at Shillong and Rangoon which serve as sources of supply for the former. A sympathetic movement from year to year between the prices at Shillong and Calcutta is distinctly noticeable, although the rise and fall is not in the same proportion in both the markets.



Unfortunately, no systematic record of the retail prices of potatoes exists anywhere in India. Some local bodies, *e.g.*, municipalities and cantonment boards, do maintain some sort of a record, but these are defective and cannot be relied upon. These bodies usually issue prices a week or a fortnight in advance and the figures are ordinarily based on prices then prevailing. They are, therefore, never in harmony with day-to-day conditions of the retail market. The only useful purpose these records serve is to indicate the general conditions of the trade.

Seasonal fluctuations in the retail prices correspond to similar fluctuations in the wholesale prices. A record of the average monthly retail prices of potatoes for the period 1932-33 to 1936-37 at Lahore shows that prices are low from January to June and high during the rest of the year. In August and September they are nearly double of what they are from January to March. The average prices, however, remained more or less steady during the quinquennium 1932-33 to 1936-37. A similar tendency has been observed in Calcutta where prices are low during January to March and rise as the season advances.

It is unfortunate that there are no uniform standards for price quotations. In some markets, prices are quoted on a maund basis and in others on a bag basis. Both the maund and the capacity of a bag vary from place to place and it is difficult to compare the prices prevailing in different markets. Thus, in the Punjab, the unit of weight in the wholesale trade is generally a maund which varies from 40 seers in some markets to 50 in others. Then again, different maunds may be used in the same market for products obtained from different sources. In Rawalpindi, for example, the maund consists of  $51\frac{1}{2}$  seers for the Kashmir produce and  $52\frac{1}{2}$  seers for the Murree produce. Again, a maund may consist of 43 seers during the period of abundant supplies and 42 seers at the beginning and end of the season. Wholesalers use a maund of 40 seers when selling to retailers, but for imported produce, a maund of  $40\frac{1}{4}$  seers is in use throughout the Punjab. In Bengal, the customary unit of quoting wholesale prices is a maund of 40 seers, but in almost all the markets an excess of one seer per maund is allowed as a *dolati*. In Dacca, a maund of  $43\frac{1}{2}$  seers is used in the case of potatoes imported from Bihar. In retail trade, a seer consists of 80 tolas, but in some parts it varies from 60 to 90 tolas. At Mettupalaiyam in Madras, the unit for wholesale transactions consists of four baskets of 50 lb. each when purchasing the produce from growers and a bag of 190 lb. net for export trade. In retail trade, the customary unit of sale is a viss of 3 lb. In

the Central Provinces, the unit of price quotation for wholesale transactions varies with the locality and type of the product. For the home-grown produce, it is a maund of 40 seers or a *gon* of 3 maunds and for seed a maund of 40 seers known as *zalli* (basket load). The unit for the imported produce for consumption is a maund of 40 seers or a bag weighing from two maunds to two maunds and sixteen seers. In Bombay, a very large number of units prevail in the different markets for wholesale price quotations. Auction sales of whole heaps (as at Manchar) and of unweighed bags are in vogue in villages.

The existence of different weights and measures is a great hindrance to the development of organised trade, as it makes ready comparison of price statistics from different markets extremely difficult. Recently, however, Bombay has partly succeeded in co-ordinating the various standards of weights and measures in the presidency. In 1936, the Bombay Weights and Measures Act was passed and according to this Act, the unit of retail sales in most of the towns is either a pound or a seer of 80 tolas. The passing of the Standards of Weight Act (1939) by the Central Government makes uniform progress possible throughout the whole of India. It now remains for the provinces and States to take necessary active measures as soon as possible.

After leaving the producer's holding, potatoes pass through several agencies before they reach the consumer. The cost of distribution increases according to the number of times the commodity changes hands before it reaches the final consumer. The producer's share in the price paid by the consumer varies from 45 to 70 per cent : the rest goes to the intermediaries. The share received by transport agencies depends on the distance between the consuming and the assembling markets. For instance, in the case of produce of Malir area sold in Karachi, the share of transport is very small while in the case of the produce of Nilgiri area sold in distant markets such as Madura and Mangalore, the share of transport agencies is comparatively high. Generally speaking, the grower gets about 50 per cent of the price paid by the consumer. The cost of distribution is, therefore, rather high at present. There is considerable scope for the reduction of the number of intermediaries and their charges. Arrangements for bulk transport would reduce the cost of carriage. The establishment of reliable sales agencies and an extension of market news service would enable the cultivator to obtain better price for his produce.

There is a general complaint that producers do not get fair prices for their produce on account of their ignorance of market

conditions. The absence of an organised system of market intelligence is mainly responsible for this exploitation of the cultivator by middle-men and merchants. Arrivals and stocks or wholesale and retail prices of potatoes are seldom recorded and cultivators get their information about market conditions from co-villagers who have been to an *arhatiya* or a dealer, or from itinerant merchants who visit producing areas for making purchases. It is obvious that such information cannot always be regarded as trustworthy.

Merchants in producing centres often visit the area of production to get an idea of the expected volume of production. They also keep contact with the merchants in consuming areas and fellow traders in other parts of the province. The commission agents in the main consuming markets furnish information to the merchants in the assembling markets by postal correspondence and in case of urgency by telegrams and telephones. But business is conducted mainly on shrewd guesses without the commission agents committing themselves in any way about prices. Recently efforts at improving market intelligence have been made in some areas.

The United Provinces Fruit Development Board started in 1937 a fortnightly bulletin for giving information about stocks, arrivals, wholesale and retail prices and forecasts of demand for some fruits and vegetables including potatoes for some selected markets in the province. This publication serves a useful purpose. But in the Punjab, the official system for collecting the information does not seem to be efficient. The daily newspapers supplying information about agricultural produce have so far neglected the potato trade. In view of the increasing importance of this commodity, it is desirable that they should devote some space to this also in future.

The radio is another agency through which market news can be disseminated to different parts of the country. Though it is a recent innovation in this country, it is full of potentialities. Potato trade deserves a place in the commercial news bulletin broadcast by the All-India Radio from Delhi, Calcutta and Bombay and arrangements should be made to broadcast the daily or weekly prices of potatoes and the general movements of the trade as a whole. For this purpose it is desirable to have a separate organisation for the collection of information regarding stocks, arrivals, daily prices and the amount of business done in various markets and their general tendencies. The information may be disseminated through the press and the radio and also sent to the local marketing staffs and selected commission agents in different markets.

In Burma, there is a considerable fluctuation in prices in the course of the marketing season. Prices of potatoes in Rangoon are low from March to September. They begin to rise in October when supplies decline, and reach their highest in November. There is also a definite relationship between available supplies and prevailing prices from year to year. With an increase in supply there has usually been a fall in the prices and vice versa. The increase in the total available supply of Shan States from 25,245 tons in 1926-27 to 31,294 tons in 1928-29 lowered the price per 100 viss at Aungban from Rs. 15-4 to Rs. 11-8. The next two years were abnormal as the prices, in spite of heavy supplies, remained high. The slump in agricultural prices generally and the increase in the supplies from 31,460 tons in 1931-32 to 49,775 tons in 1933-34, again caused a severe drop in the price from Rs. 12-12 to Rs. 4-12. In 1934-35, prices again rose to Rs. 11-8 but declined in 1935-36 to Rs. 7-8 and in 1936-37 to Rs. 6-8 per 100 viss. Since 1932-33, prices have not followed any definite trend but appear to have been affected by local production and also by supplies available from other sources in the Calcutta market.

## CHAPTER IV.—PREPARATION FOR MARKET.

### A.—Harvesting.

From the time the potatoes are harvested and until they start their journey to their ultimate consuming market, they pass through a stage of preparation which has an important effect on the eventual net return.

The two important features of harvesting are the time of harvesting and the methods of harvesting. When the potatoes are grown in sandy or sandy loam soils the harvesting is comparatively an easy affair and can be done without the use of any appliance. For example, in the case of potatoes grown in the river bed at Ahmedabad, Bombay Presidency, (see plate facing page 72) the tubers are exposed and collected simply by stirring the ridges by hand. When, however, the soil is hard, as in Belgaum and Satara districts, a plough has to be used to expose the tubers particularly after rains when the soil becomes very hard.

#### (1) TIME OF HARVESTING.

Usually the withering of the foliage is an indication of the maturity of the crop. Sometimes, as in the United Provinces, the growers dig out the tubers from the different portions of the field to see if they are mature.

The time of harvesting is also determined by the market demand and the selling prices. In the case of the early crop, the tubers are rarely allowed to reach full maturity. Harvesting operations usually begin as soon as the yield of marketable potatoes justifies the sacrificing of greater yield later for securing the higher prices prevailing in the early part of the season. The grower's need for money and the time of planting of the succeeding crop also influences the harvesting time. When the harvesting is undertaken in the early part of the season, the general tendency is to dig out only small quantities at a time which can be easily disposed of. Another reason for harvesting the crop early is the fear of damage by wild animals or disease as is the case in Madras.

The immature tubers get oxidised and develop a dark brown colour if they are kept for some time. The colour of such tubers does not find favour with the retail trade with the result that the returns are considerably lowered. Expectation of rains also affects the harvest time. The cultivators usually desire to harvest the crop before the rains set in, as otherwise the mature tubers develop a sort of eruptive skin. Moreover, the crop harvested from a wet soil has a dirty appearance on account of large quantities of mud sticking to the tubers.

#### (2) METHODS OF HARVESTING.

The crop is harvested with the help of a country plough or a pick-axe (*kudali*), or a hand-hoe (*khurpa*). As already stated, harvesting is also done without the use of any implement by simply breaking the ridge with hand.

The tubers are usually dug when the soil is in a good workable condition i.e., neither too wet nor too dry. The plough is used in the hilly areas of the Punjab and Patiala, in Belgaum and Poona districts of the Bombay Presidency,

in Hyderabad State and occasionally in Bengal. The plough is usually set to work to its maximum depth so that the share of the plough may not damage the tubers. Less time is required in harvesting with a plough than with the pick-axe or the hand-hoe but the percentage of loss is higher as the tubers get damaged by being trampled upon by the bullocks or cut by the plough.

The use of a plough saves labour and the cost of harvesting is comparatively low. For example, in Bengal the cost of harvesting with a plough works out at Rs. 5-8 and with a pick-axe at Rs. 8-12 per acre.

The most widespread method of digging out the potato is by means of a pick-axe or a hand-hoe. The implement in either case is used very carefully so that no tubers are cut.

There are usually two sets of labourers employed on the job. One opens out the ridges and the other collects the exposed tubers and heaps them up in a central place. Males and females are indiscriminately employed. The men usually do the digging and the females are engaged in collecting the tubers. The wages for women are usually two-thirds of those for the men.

After the harvest is over, the potatoes are taken away or stored in the field for sometime. No special arrangement for storing is made and the produce is simply heaped under the shade of a tree and covered with reeds, worn out rags, old bags, etc. Protection from rain and sun is essential because if the freshly dug out tubers are exposed to the hot sun for a long time they get spoiled and develop a green pigment which is not desirable. In case the potatoes are to be stored for a longer period, they are taken to the village and are stored in the houses. In certain places as in Bombay and the Central Provinces, they may even be stored in pits in the field. (For details see Chapter on "Storage"). The potatoes are usually kept in the field for not more than 10 to 15 days depending upon the prices in the market. If the grower finds a ready sale he may sell the entire heap at once. When the demand is small, the grower usually keeps on removing potatoes daily from the heap and sells them in the market in small lots. The crop after harvest and before despatch to the market receives little attention in regard to preparation. Potatoes dug out in the morning usually get dry by the evening and the earth sticking to them falls off automatically. At times when the rains have spoiled the tubers or when potatoes have been dug out from a wet field, the growers get their produce washed before sale but this is, as a rule, very rare.

### (3) DAMAGE IN HARVESTING.

The damage in harvesting depends mainly upon (i) the method of harvesting, (ii) distance of planting, (iii) nature of the soil and (iv) skill of the labour employed. The damage is greater when potatoes are dug out by means of a plough than it is in the case of a pick-axe or a hand-hoe. In Bengal, for instance, the damage in harvesting is 5 to 7 per cent with plough and 2 to 3 per cent with pick-axe or a hand-hoe. This is so because the blade of a plough is comparatively bigger in size and its working with the help of bullocks cannot be properly controlled. The pick-axe and the hand-hoe are very handy implements and can be used with much precision.

The percentage of damage varies with the distance of planting also. If the crop is thickly grown, the losses are greater than when it is grown in lines sufficiently apart from one another. This is particularly so when the crop is harvested with a plough. In Patiala, for example, the normal damage in harvesting is 4 or 5 per cent but it goes up to as much as 12 per cent if the planting is done closer. The nature of the soil also plays an important part.

The potatoes can be easily lifted from a loose sandy soil without the use of a plough and in some cases, as in Ahmedabad, even without the use of a hand-hoe. If the soil is hard, a plough has generally to be used. Even when a pick-axe is employed, much greater force has to be applied and so the damage done is greater. The estimated percentage of damage in harvesting in some of the important potato producing provinces and States is given below :—

*Estimated percentage of damage in harvesting in some of the important potato producing areas.*

Name of the province or State.	Percentage of damage.	
	From.	To.
United Provinces . . . . .	2.0	10.0
Bihar . . . . .	1.0	3.0
Bengal . . . . .	2.0	7.0
Assam . . . . .	2.0	3.0
Bombay . . . . .	0.5	1.0
Madras . . . . .	1.0	2.0
Punjab . . . . .	1.0	3.0
Central Provinces . . . . .	2.0	3.0
Patiala . . . . .	4.0	12.0
Travancore . . . . .	5.0	6.0
Hyderabad . . . . .	1.0	2.0
Baroda . . . . .	2.0	3.0

From the foregoing table it will be seen that the percentage of damage in harvesting varies from 0.5 to 12 per cent. This high range of variation is due to the differences in the methods of harvesting and in the types of the soils. The percentages of damage in Patiala, United Provinces, Bengal and Travancore is comparatively high, particularly when a plough is used. No doubt the harvesting of potatoes can be done quicker with a plough but in the long run its use may not be economical as a greater proportion of tubers get damaged. The percentage of damage can be reduced considerably if the potatoes were planted in straight rows, say, two feet apart so that the plough could be controlled easily. In the United States of America and most of the European countries such as England, Germany, etc., special potato diggers are used for lifting the crop. They work quickly and cause very little damage. In India also they could be adopted with advantage in places where cultivation is done on a large scale.

#### (4) COST OF HARVESTING.

Ordinarily a grower does not undergo any expenditure for the harvesting of his crop.

For harvesting an acre of potatoes in a day the number of labourers employed may be as low as 10 (5 men and 5 women), as in the case of Bihar and Orissa, or as high as 25 as in Bengal. The variation is due to the nature of the soil, for, if the soil is hard, greater effort is necessary. The wages usually vary from place to place. At some places they are paid in kind and at others in cash. The average wages paid to a male labourer amount to annas six a day, the two extremes being 3 annas per day in Kaira district in Bombay Presidency and 12 annas per day in the Malir tract in Sind. The wages of a female employee range from two annas per day in Orissa to five annas per day in Assam, the average per day being 4 annas.

The cost of harvesting the crop with a plough is lower than by means of *kudalis* and *khurpas*. This is true in the case of large holdings. The estimated average costs of harvesting potatoes in the different provinces and States in India are given in the following table :—

*Estimated costs of harvesting potatoes in different provinces and States.*

Province or State.	Cost per maund.		
	Rs.	A.	P.
United Provinces . . . . .	0	0	9
Bihar . . . . .	0	0	8
Bengal . . . . .	0	1	6
Assam . . . . .	0	2	9
Bombay . . . . .	0	0	10
Madras . . . . .	0	1	0
Punjab . . . . .	0	2	0
Central Provinces . . . . .	0	0	7
Sind . . . . .	0	1	2
Orissa . . . . .	0	2	0
Patiala . . . . .	0	1	8
Baroda . . . . .	0	1	0
Hyderabad . . . . .	0	1	5
Travancore . . . . .	0	1	4
Gwalior . . . . .	0	1	9
Average . . . . .	0	1	4

As will be seen from the above table, the cost of harvesting varies from a minimum of seven pies per maund in the Central Provinces to a maximum of two annas and nine pies in Assam. As has been explained already, the variations in the cost of harvesting are due to the differences in the level of wages, the nature of the soil and the method employed for harvesting. In most cases, however, the costs vary from one to one and a half anna per maund, the average cost being a little over one and a quarter anna.



In Burma, the methods of harvesting are similar to those adopted in India. Ridges are split open either by digging with *mammooties* (hand implements) or by running a plough along the furrows if line planting has been done. The former method is the more common. The potatoes are gathered by the cultivator's family or by labourers. They are then shaken and rubbed with hands to get rid of the soil sticking to the tubers. They are next heaped in the field and may be sold or taken into a compartment in the cultivator's hut for temporary storage.

Damage done to the tubers during the harvesting of the crop ranges from 2 to 6 per cent according to the method of digging. It is higher in case of ploughs and lower in the case of hand implements.

The cost of harvesting in Burma amounts to Rs. 8-6-4 per acre which exceeds the average cost of harvesting in India by Rs. 1-6-4. This is due to the comparatively higher wages paid in Burma. The wages of a male cooly in Burma vary from eight to ten annas while those of a female from four to six annas a day.

### **B.—Methods of packing.**

The importance of packing the produce is generally not fully realised and potatoes are transported loose as far as possible. The keeping qualities of potatoes depend to a great extent on the manner in which they are handled in the initial stages of the process of marketing. If handled in bulk, they suffer a good deal and do not keep long. If packed loose in carts, they are liable to be damaged by friction caused by jolting during transport. The distance of the destination is an important consideration in the selection of a suitable method and thus the method of packing of the produce sold in local markets is different than that followed in the case of produce sold in distant markets.

#### **(1) FOR LOCAL SALE.**

Potatoes intended for local sale are usually brought to the market in baskets or loose in carts or sometimes in gunny bags. When brought in carts, some dry grass or straw is put at the bottom and the sides. This prevents the potatoes from falling and also serves as a cushion. The top is covered with dry grass, gunny cloth or tarpaulin. When bags are used they are generally not filled in properly, nor stitched carefully. Sometimes when a sufficient number of bags is not available, they are filled to their maximum capacity.

#### **(2) FOR SALE IN DISTANT MARKETS.**

If the potatoes are intended to be sent to distant markets, they are collected and allowed to remain in the open for a few hours after harvesting to dry up. They are then packed into gunny bags after sorting out the diseased and damaged ones. Very often the small tubers are also sorted out and either retained for seed purposes or sold separately. Potatoes grown in the hills cannot be properly dried locally on account of the damp climate in the season of harvesting. They are, therefore, usually assembled at a market at the foot of a hill where they are kept for a few days before despatch to consuming markets, so that the excess moisture might dry up. The Nilgiri, Kumaon and Simla Hills potatoes, for example, are mostly assembled and packed at Mettupalaiyam, Haldwani and Kalka respectively, which are situated at the foot of the hills. It has been observed that potatoes sent out in bags directly from the hills carry a comparatively larger proportion of earth and moisture

as a result of which their colour becomes dark, particularly if they remain in the bags for a few days. In such cases, the potatoes also do not keep so long as those properly dried before being packed.

As a rule, potatoes are sent out to distant markets in bags. The big size tubers are generally placed on the top and the small ones at the bottom. The bags are usually filled to their maximum capacity. Sometimes, to accommodate more potatoes, an extra piece of gunny cloth (burlap) is stitched on to the mouth of the bag. (See plate facing page 73). After stitching the bag, the packer applies some dye to the string used for stitching. This is done as a safeguard against pilfering during transit; for, in case the bags are opened, any tampering would be easily noticeable unless the same dye is applied to the string after the bag has been re-stitched.

At some places, e.g., in the United Provinces, Bihar and the Central Provinces, the seed tubers are packed in baskets made of bamboo, *jhau*, *arhar*, mulberry or cane. Potatoes are put loose in the baskets without using any packing material. The mouth of the basket is covered with a gunny cloth or a bamboo lid which is stitched with a gunny string. (Please see plate facing page 73).

### (3) IMPORTED POTATOES.

The Italian potatoes are received in bags containing 50 to 60 kilos (1 maund 14 seers to 1 maund 24 seers) or in baskets and crates of more or less the same capacity (see plate facing page 90). The large and small size potatoes are usually packed mixed in the same container. The variation in the size of the tubers is, however, not so big as in the case of potatoes packed in India. Damage during the long sea voyage is comparatively less in the case of crates but greater in bags. In Kenya Colony, potatoes are packed loose either in empty petrol cases, cement barrels or bags. Potatoes from Burma are received in bags and their method of packing is the same as in India.

### C.—Containers.

The containers used for the transportation of potatoes from one market to another may either be retained by the buyer or returned to the consignor. While settling the bargain, this point is always made clear. The common practice is that the containers, in which the produce is brought to the local assembling markets, are returned. When, however, the produce is sent to distant markets, they are not returned. A brief account of the type of containers used for potatoes sold locally and in distant markets is given in the following paragraphs.

#### (1) CONTAINERS USED FOR POTATOES SOLD IN LOCAL MARKETS.

Containers are not of much importance in the case of potatoes taken for sales to local markets in the producing areas. The produce is mostly carried loose in carts or in baskets. Sometimes gunny bags are also used. When the quantity of the produce is small, baskets are generally used. They are more commonly used in the hills than in the plains. There is no standard type of basket. They vary in size, shape, etc., from place to place. The baskets used in the hills are mostly "V" shaped (see plate facing page 90), whereas those used in the plains are basin shaped. The former type of baskets are carried on back while the latter on head and they are used only when the market is not very far off from the producing area. Second-hand gunny bags are used when the market is situated at a long distance or when large

quantities of the produce are to be taken. In Simla Hills, besides the ordinary gunny bag, a special kind of bag known as *pariler* is also used. This is made of goat hair and can hold roughly four or five maunds of potatoes.

In some places as in the Nilgiris, the bags are provided by the commission agents who charge hire for them. The hiring charges of the Mettupalaiyam merchants are about 6 pies per bag per trip.

## (2) CONTAINERS USED FOR POTATOES DESPATCHED TO DISTANT MARKETS.

When potatoes are to be exported to distant markets involving journey by rail, motor lorry or boats, they are, as a rule, packed in some sort of a container. The most common type of container used all over the country is the second-hand gunny bag which has been previously used for grains. If, however, potatoes are to be sent to a distant place, or there is to be transshipment *en route*, new bags are also used. Simla potatoes, for example, when sent to distant markets such as those in Bihar and Bengal are packed in new bags. The bag most commonly used all over the Punjab and in Madras and Bombay Presidencies is "B" twill type, having blue lines along its length. It measures about 38" in length and 26" in width and weighs on the average  $2\frac{1}{2}$  lb. It can hold from 2 to  $2\frac{1}{4}$  maunds of potatoes.

In Bihar and the Central Provinces, bamboo baskets mostly basin shaped are used for transporting seed potatoes. The one commonly used holds about 35 seers of seed potatoes (see plate facing page 73). The seed potatoes at the time of export are rather soft and are in a sprouted condition. They are not sent in bags as the damage in this case is high. Moreover, sprouting under such conditions is also accelerated and thus the viability of the tuber is considerably reduced.

## (3) COST OF CONTAINERS.

The average price of new bags in the pre-war days was Rs. 25 per 100 bags and that of the second-hand bags from Rs. 12 to Rs. 20 per 100 depending mainly upon the condition of the bags.

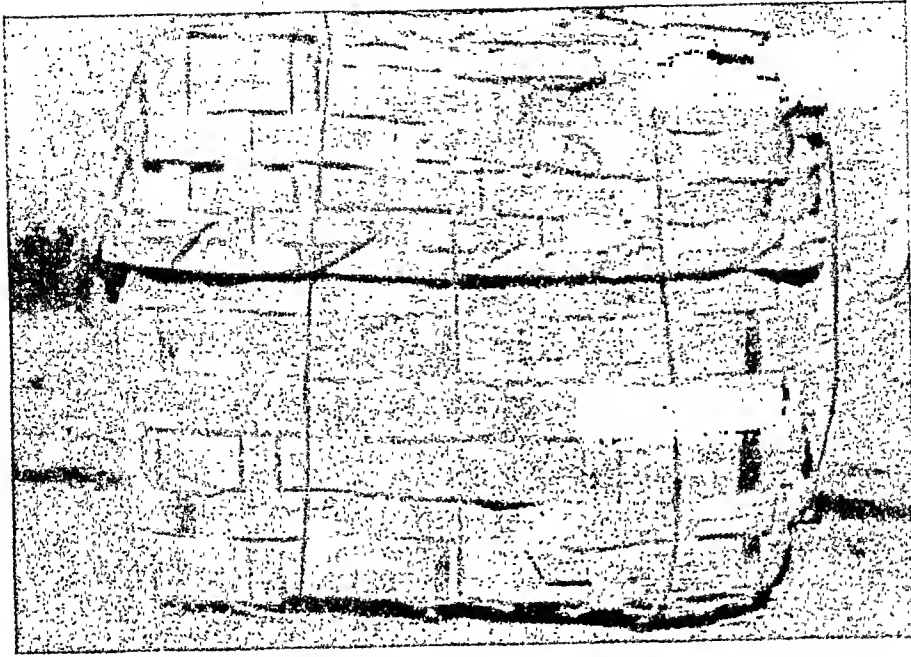
The basket used for packing seed potatoes in Bihar costs one to one and a half annas while the one used for carrying table potatoes to the local markets costs six pies to two annas according to size. In other parts of the country also the prices of the baskets vary with the capacity.

In Burma, the potatoes are generally assembled loose but sometimes in baskets. From the assembling markets onwards, the produce is packed in gunny bags, each with a capacity of 40 to 55 viss (a viss is equal to 3.6 lb.). As in India, they may or may not be returnable. Bags are found to serve the purpose quite well.

## D.—Cost of preparation for market.

The cost of preparing the potatoes for market involves expenditure on multifarious items such as digging, picking and carrying home the produce from the field, sorting of damaged tubers, filling and sewing of bags, transportation from the producer's godown to the local assembling market, etc. The cost on these items differ from place to place according to the number of coolies employed and wages paid to them. The following few examples will give some idea about the cost of preparing the potatoes for market ;

In Bengal, 30 labourers at the rate of 5 annas each per diem are required for digging, picking and carrying home the produce of one acre. The total cost on all the above operations comes to Rs. 9-6-0. If the digging is done with



CRATES IN WHICH ITALIAN POTATOES ARE RECEIVED.



A CONICAL SHAPED BASKET IN WHICH POTATOES ARE BROUGHT TO THE LOCAL MARKET IN THE HILLS.



SORTING OF POTATOES BEFORE SALE.



GRADES OF SEED POTATOES IN BIHAR.

a plough, 6 labourers at the aforesaid rate and 6 pairs of bullocks at the rate of 12 annas per pair per diem are required for digging and 15 coolies for picking and carrying home the produce. Thus the total cost for digging, picking and taking the potatoes from the field to the cultivators' home comes to Rs. 11-1-0 per acre. For sorting the damaged tubers three coolies are employed and the cost on this account comes to 15 annas per acre. The cost of filling and sewing the bags at the rate of 6 pies per bag of 2 maunds comes to Rs. 1-6-6, taking the average yield of the province to be 90 maunds per acre. The depreciation of such bags at the rate of 3 pies each amounts to Re. 0-11-3. Lastly, the cost of transporting potatoes from the grower's godown to the local assembling market for a distance of about 3 to 3½ miles at the rate of 2 annas per bag in carts comes to Rs. 5-8-0. Hence the total cost of preparing the potatoes for market in Bengal varies from Rs. 17-14-9 to Rs. 19-9-9 per acre, or from Re. 0-3-2 to Re. 0-3-6 per maund.

In Bihar, one labourer can dig out potatoes from one *katha* of land (32 *kathas*=1 acre) every day. Wages are usually paid at the rate of 6 annas per day. Thus the cost of digging comes to Rs. 12-0-0 per acre or Re. 0-1-10 per maund, taking the average yield of potatoes in the province to be 105 maunds per acre. Sorting is generally not done if the produce is sold for table purposes and the produce is usually sold at the farm soon after harvesting. If the potatoes are to be stored for seed purposes the sorting is usually done and the cost on this account comes to 6 pies per basket of one maund and the cost of preparation for market in this case comes to Re. 0-3-1. The weighing and filling of bags is usually done by the cultivators themselves and the cost on this account is estimated to be 6 pies per bag of 2 maunds. In this case the cost of transporting the produce from the field in carts comes to 6 pies per basket of one maund for a distance of one mile. Hence the total cost of preparation for market is roughly Re. 0-2-7 per maund in the case of table potatoes.

In the Nilgiri Hills of the Madras Presidency 12 men at the rate of 8 annas each and 66 women at the rate of 4 annas each per diem are required for digging, cleaning and carrying home potatoes from one acre of land. Thus the total cost of harvesting comes to Rs. 22-8-0 per acre, or Re. 0-3-7 per maund, taking the average yield of the province to be 100 maunds per acre. The cost of transporting potatoes in lorries from the grower's farm to Mettupalaiyam, the principal assembling market, amounts to 3 pies per maund. Hence the total cost of preparation for market comes to Re. 0-3-10 per maund in the Nilgiri Hills.

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*Preparation for market. ]*

## INTER-CHAPTER FOUR.

When potatoes are grown in sandy or sandy loam soils, the harvesting is comparatively an easy affair and can be done without the use of any appliance. For example, in the case of potatoes grown in the river bed at Ahmedabad, Bombay Presidency, the tubers are collected simply by stirring the ridges by hand. When, however, the soil is hard, as in Belgaum and Satara districts, a plough has to be used to expose the tubers, particularly after the rains when the soil becomes very hard.

In the case of the early crop, tubers are rarely allowed to reach full maturity. Harvesting operations usually begin as soon as the yield of marketable potatoes justifies the sacrificing of subsequent greater yield with a view to securing the higher prices prevailing in the early part of the season.

The crop is harvested with the help of a country plough or a pick-axe or a hand-hoe. The use of plough saves labour and the cost of harvesting with it is comparatively low. For example, in Bengal the cost of harvesting with a plough works out at Rs. 5-8-0 and with a pick-axe at Rs. 8-12-0 per acre. The most widespread method of digging out the potato is by means of a pick-axe or a hand-hoe. In either case the implement is used very carefully so that no tubers are cut.

No special arrangement for the storing of potatoes is made and the produce is simply heaped under the shade of a tree and covered with reeds, worn out rags, old bags, etc. Protection from rain and sun is essential because if the freshly dug out tubers are exposed to the hot sun for a long time they get spoiled and develop an undesirable green pigment. When potatoes have to be stored for a longer period, they are taken to the village and are stored in houses. In certain places, *e.g.*, in Bombay and the Central Provinces, they may even be stored in pits in the field. Potatoes are not usually kept in the field for more than 10 to 15 days. If the grower finds a ready sale, he may sell the entire heap at once. When the demand is small, the grower sells potatoes from the heap in small lots every day. After harvest and before despatch to the market, the crop receives little attention in regard to preparation. Potatoes dug out in the morning usually get dry by the evening and the earth sticking to them falls off automatically. At times, when the rains have spoiled the tubers or when potatoes have been

dug out from a wet field, the growers get their produce washed before sale but this is, as a rule, very rare.

Damage in the course of harvesting depends mainly upon (i) the method of harvesting, (ii) distance of planting, (iii) nature of the soil and (iv) skill of the labour employed. The damage is greater when potatoes are dug out by means of a plough than when a pick-axe or a hand-hoe is used. In Bengal, for instance, the damage caused in harvesting is 5 to 7 per cent with plough and 2 to 3 per cent with a pick-axe or hand-hoe.

The percentage of damage also varies with the distance of planting. In Patiala, for example, the normal damage in harvesting is 4 to 5 per cent but it goes up to as much as 12 per cent if the planting is done closer.

A survey of damages caused in some of the important potato producing areas shows that the percentage of damage in harvesting varies from 0·5 to 12 per cent. This high range of variation is due to differences in the methods of harvesting and in the types of the soils.

For harvesting an acre of potatoes in a day the number of labourers employed may be as low as 10 (5 men and 5 women) as in Bihar and Orissa, or as high as 25 as in Bengal. These labourers are either paid in kind or in cash. The average wages paid to a male labourer amount to six annas a day, the two extremes being 3 annas per day in Kaira district in Bombay Presidency and 12 annas per day in the Malir tract in Sind. The wages of a female labourer range from two annas per day in Orissa to five annas per day in Assam, the average per day being 4 annas.

The cost of harvesting the crop with a plough is lower than by means of *kudalis* and *khurpas*, particularly in large holdings. The cost of harvesting ranges from a minimum of seven pies per maund in the Central Provinces to a maximum of Re. 0-2-9 per maund in Assam. In most cases, however, the cost varies from 1 to 1½ annas per maund, the average cost being a little over one and a quarter anna.

In Burma, the methods of harvesting are similar to those adopted in India. Potatoes are gathered by the cultivator's family or by labourers. They are then shaken and rubbed with hands to get rid of the soil sticking to the tubers. They are next heaped in the field and may either be sold forthwith or taken into a compartment in the cultivator's hut for temporary storage. The damage done to the tubers during the harvesting of the crop ranges from 2 to 6 per cent according to the method



of digging. The cost of harvesting in Burma amounts to Rs. 8-6-4 per acre which exceeds the average cost of harvesting in India by Rs. 1-6-4. This is due to the comparatively higher wages paid in Burma. The wages of a male cooly in Burma vary from eight to ten annas while those of a female cooly vary from four to six annas a day.

The importance of packing potatoes is not generally appreciated and the crop is transported loose. The keeping quality of potatoes depends to a large extent on the manner in which they are handled in the initial stages of the process of marketing.

Potatoes intended for local sale are usually brought to the market in baskets or loose in carts or sometimes in gunny bags. If the potatoes are intended to be sent to distant markets, they are collected and allowed to remain in the open for a few hours after harvesting to dry up. They are then packed into gunny bags after sorting out the diseased and damaged ones. Potatoes grown in the hills cannot be properly dried locally on account of the damp climate during the season of harvesting. They are, therefore, usually assembled at a market at the foot of the hills where they are kept for a few days before despatch to consuming markets, so that the excess moisture may dry up. The Nilgiri, Kumaon and Simla Hills potatoes, for example, are mostly assembled and packed at Mettupalaiyam, Haldwani and Kalka respectively, which are situated at the foot of the hills. It has been observed that potatoes sent out in bags from the hills direct carry a comparatively larger proportion of earth and moisture as a result of which their colour becomes dark, particularly if they remain in the bags for a few days.

As a rule, potatoes are sent out to distant markets in bags. The big size tubers are generally placed on the top and the small ones at the bottom. The bags are usually filled to their maximum capacity. Sometimes to accommodate more potatoes, an extra piece of gunny cloth (burlap) is stitched on to the mouth of the bag. After stitching the bag the packer applies some dye to the string used for stitching. This is done as a safeguard against pilfering during transit, for in case the bags are opened any tampering would be easily noticed unless the same dye was applied to the string after the bag had been re-stitched. In some places, *e.g.*, in the United Provinces, Bihar and the Central Provinces, the seed tubers are packed in baskets made of bamboo, *jhau*, *arhar*, mulberry or cane. Potatoes are put loose in the baskets without any packing material.

Regarding imported potatoes, Italian potatoes are received in bags containing 50 to 60 kilos (1 maund 14 seers to 1 maund 24 seers) or in baskets and crates of more or less the same capacity.

The containers used for the transportation of potatoes from one market to another may either be retained by the buyer or returned to the consignor. When settling the price of a consignment, this point is always made clear. The common practice is that the containers in which the produce is brought to the local assembling markets are returned. When, however, the produce is sent to distant markets they are not returned. In some places, as in Nilgiris, the bags are provided by commission agents who charge hire for them. The hiring charges of the Mettupalaiyam merchants are about 6 pies per bag per trip.

The most common type of container used all over the country is the second-hand gunny bag which has been previously used for grains. If, however, the potatoes are to be sent to a distant place, or there is to be a transshipment *en route*, new bags are used. Simla potatoes, for example, when sent to distant markets such as those in Bihar and Bengal, are packed in new bags. The bag most commonly used all over the Punjab and in Madras and Bombay Presidencies is "B" twill type, having blue lines along its length. It measures about 38" in length and 26" in width and weighs on an average  $2\frac{1}{4}$  lb. It can hold 2 to  $2\frac{1}{4}$  maunds of potatoes.

In Bihar and the Central Provinces, bamboo baskets, mostly of basin shape, are used for transporting seed potatoes. Those commonly used hold about 35 seers of seed potatoes each. Seed potatoes for export are rather soft and are in a sprouted condition. They are not sent in bags as they may get damaged if sent in this manner.

The basket used for packing seed potatoes in Bihar costs 1 to  $1\frac{1}{2}$  annas while the one used for carrying table potatoes to the local markets costs six pies to two annas according to size. In other parts of the country also, the price of the baskets varies with the capacity.

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## CHAPTER V.—GRADING AND STANDARDISATION.

### A.—General.

Standardisation is one of the important principles of modern commerce. It helps in the collection and dissemination of market information and enables goods to be sold on the basis of their description. The graded goods can be readily bought or sold without inspection. In India, at present, potatoes have usually to be personally examined to find out the proportion of diseased, damaged and unripe tubers, before they can be purchased. This entails loss of time and money and adds to the cost of the produce. When goods are bought without inspection there are frequent disputes about quality. Grading, as practised in most of the large potato producing countries of the world, does not exist in India. There is, therefore, need for the grading of potatoes for table and seed purposes, particularly for the latter, as size, varietal characters and freedom from disease are very important factors in their case.

Very frequently, the tubers of different varieties are mixed together specially when their shapes are more or less the same. For commercial purposes, potatoes are mainly recognised as round or long but in many cases the tubers of round varieties are mixed with those of the long ones. This defect in marketing results in lack of confidence between buyers and sellers. Without definite and reliable standards it is also difficult to compare accurately the price levels in different markets.

### B.—Present practices.

Grading of potatoes according to any recognised and definite standards was till recently not done anywhere in India. Isolated attempts at rough sorting and grading are made by different agencies engaged in the distribution of the produce (see plate facing page 91). The standard of grading varies from locality to locality and from individual to individual. For example, in certain areas, the growers sort out only the very small, diseased and damaged potatoes before taking the produce to the market; in others, they sort it into three or four grades. Size is the main consideration in grading and other factors such as freedom from diseases and presence of tubers having different varietal characteristics, etc., are generally not considered important. The methods of grading followed by the different agencies engaged in the distribution of potatoes are discussed below.

#### (1) PRODUCERS.

Growers do not generally take any important part in the grading of their produce. In Bihar, Bombay, Madras, the Central Provinces and Orissa, however, they sort out the rotten and badly damaged potatoes. Sometimes as in Bombay and Madras, they go a step further and separate all potatoes which are green or below  $\frac{1}{2}$ " diameter. The discarded tubers are sold in the local markets or kept for consumption in the household or fed to cattle. The sorting of the produce by the cultivator himself is not properly done and has to be done over again in the market under the supervision of the commission agent.

In the United Provinces, the cultivators sort out damaged, rotten and very small tubers and also those suitable for seed purposes. The rest of the produce is sold mixed locally as *gud*. In Farrukhabad, where large quantities of potatoes are retained for seed purposes, the sorting is done a little more

carefully. All tubers, which are above one inch in diameter, are sorted out and sold for table purposes, being classed as *Chatta*, meaning selected. Potatoes from  $\frac{1}{4}$ " to 1" in diameter are selected for seed purposes and are classed as *Manjhola*, meaning medium. Those left over are called *Chhote*, i.e., small, and are utilised for domestic purposes. The seed potatoes are further graded into  $\frac{1}{4}$ ",  $\frac{1}{2}$ ",  $\frac{3}{4}$ " and 1" sizes at the time of planting, as different markets demand different sizes. In the hills, the cultivators sort out seed potatoes for their own use, the rest of the produce being sent mixed to the assembling markets. In some parts, however, the growers do not sort their produce at all.

In Belgaum in the Bombay Presidency, the growers pay considerable attention to the grading of their produce. As soon as the crop is harvested, the damaged and rotten tubers are removed and the rest of the produce is roughly divided into four grades as shown below :—

- (a) I Grade—Tubers more than 3" in diameter.
- (b) II Grade—Tubers with a diameter of 2" to 3".
- (c) III Grade—Tubers with a diameter of  $1\frac{1}{2}$ " to 2".
- (d) IV Grade—Tubers less than 1" in diameter.

The potatoes of the I and II grades are sold soon after the harvest for table purposes and those of III and IV are usually retained for seed purposes.

The producers in Bihar also grade their produce in a rough manner. One lot consists of tubers about  $1\frac{1}{4}$ " in diameter and above, which are sold for table purposes. The other consists of those below  $1\frac{1}{4}$ " in diameter, and these are retained for seed purposes. At the commencement of the planting season, the latter are generally graded into five grades as shown below (see plate-facing page 91).

*Grades commonly used for seed potatoes in Bihar.*

	Diameter.
1. Bara . . . . .	1"
2. Bara Goli . . . . .	$7/8$ "
3. Manjhola Goli . . . . .	$6/8$ "
4. Chhote Goli . . . . .	$5/8$ "
5. Chharri . . . . .	$\frac{1}{2}$ "

The potatoes are dressed over sieves having holes varying from  $\frac{1}{2}$ " to 1" or  $1\frac{1}{4}$ " in diameter. So far as the size is concerned the grading of seed potatoes is done very efficiently in Bihar. Other factors such as freedom from diseases, proportion of tubers of other varieties and:

viability of the tubers are, however, generally not strictly taken into account. It is desirable that the grading should be done according to certain prescribed standards.

## (2) VILLAGE MERCHANTS.

Like growers, the village merchants also do little in the way of grading. In the Punjab, particularly in the Simla Hills, some rough grading is done and the produce before being taken to the market, is sorted into two classes, *Phool* and *Roshan*, according to size. If the village merchants cannot do it themselves, they get it done by a commission agent who usually charges six pies per maund for this work.

## (3) WHOLESALE MERCHANTS AND COMMISSION AGENTS.

The wholesale merchants and commission agents all over the country generally grade the potatoes roughly, mainly according to size. There are no fixed and recognised standards. They generally take out the rotten potatoes and then the sound ones are sorted out into two or three sizes, i.e., big, medium and small. These terms are arbitrary and there are no definite standards by which they could be defined. Potatoes graded as big on one day may be graded as medium on another. The standards of grading in the Dehra Dun, Mettupalaiyam, Simla and Kalka markets and in some of the markets in the Bombay Presidency are more or less recognised by the trade and definite trade names have been given to potatoes of different sizes. In Dehra Dun market, potatoes are sorted out into three grades namely, *Phool*, *Gud* and *Chharri*. Big selected tubers of over one inch in diameter are classed as *Phool*, those of  $\frac{1}{2}$ " to 1" as *Gud* and less than  $\frac{1}{2}$ " as *Chharri*. At Mettupalaiyam, the produce is sorted out into a number of grades. The tubers of the *Royal Kidney* variety are sorted into five grades, i.e., *Kidney*, *Medium*, *Rasi*, *Podi* and *Small Podi*. The largest tubers measuring 3" to  $3\frac{1}{2}$ " in length and  $1\frac{3}{4}$ " to 2" in diameter, free from blemishes and of good colour are classed as *Kidney*. Tubers  $2\frac{1}{2}$ " to 3" long and  $1\frac{1}{4}$ " to  $1\frac{1}{2}$ " in diameter are classed as *Medium*. Those  $1\frac{1}{2}$ " to  $2\frac{1}{2}$ " in length and  $1\frac{1}{4}$ " to  $1\frac{5}{8}$ " in diameter and of average quality are classed as *Rasi* and the small ones  $\frac{3}{4}$ " to 1" in diameter are classed as *Podi*. These are sometimes further sub-divided into *Podi* and *Small Podi*. All the diseased and damaged tubers are classed as *Thallu*, i.e., rejections. The soft immature tubers with ruptured skin are classed as *Skinmed-off* (see plate facing page 100). The tubers of the *Great Scot* variety are sorted into a mixture of round and large size ( $2\frac{1}{2}$ " to 3" in diameter) known under the trade name of *Round*. In this lot, a small proportion of tubers of  $1\frac{1}{2}$ " in diameter is also allowed. What is left over is mixed with *Rasi* or *Podi* of the *Royal Kidney* variety.

The potatoes of different grades are sent to different places according to demand, e.g., *Round* to Bombay and Colombo; *Large Kidney* to Calcutta; *Medium* to the different district towns in the Madras Presidency; and *Skinmed-off* to Calicut and Tellicherry. *Podis* are mostly consumed locally or sometimes sent to small towns. Although this rough classification is recognised under the different trade names, yet variations occur from merchant to merchant. Sometimes, therefore, the potatoes sent out from Mettupalaiyam are re-sorted in the wholesale consuming markets. The justification for such re-sorting will be seen from the following table which gives the proportion

of the different grades actually found in consignments examined at Mettupalaiyam.

*Proportion of tubers of different grades found mixed in a few consignments examined.*

Grade.	Percentage in different lots.							
	1	2	3	4	5	6	7	8
1. Kidney. . . .	..	58.0	..	72.7	..	..	..	..
2. Medium . . . .	95.8	..	..	..	..	..	..	..
3. Rasi . . . .	..	..	55.1	..	86.6	94.4	88.3	90.0
4. Podi . . . .	0.3	30.0	19.1	7.1	8.8	2.8	8.3	8.2
5. Nadu Podi . . . .	..	1.5	2.2	9.0	..	..	..	..
6. Rotten and damaged .	1.3	7.5	2.6	2.7	1.2	1.2	2.1	0.9
7. Thallu . . . .	2.6	3.0	3.5	8.5	3.4	1.6	1.3	0.9
8. Skin peeled . . . .	..	..	17.5	..	..	..	..	..
Total .	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

In the case of consignment No. 1, which was sold under the name *Medium*, 95.8 per cent of the tubers were of medium class, according to the trade classification, 2.6 of *Thallu*, 1.3 of rotten and damaged and .3 of *Podi*. On the whole, this consignment was quite satisfactory. In a consignment, viz., No. 2 sold as *Kidney*, 58.0 per cent of the tubers were of *Kidney* class, 30.0 per cent *Podi*, 7.5 per cent rotten and damaged, 3.0 per cent *Thallu* and 1.5 per cent *Nadu Podi*. This consignment contained a large proportion of the small tubers. Consignment Nos. 3 and 4 also contained a fairly large proportion of tubers of smaller sizes. Consignment Nos. 5, 6, 7 and 8, however, contained a high proportion of the tubers of the grade under which the consignments were sold. It is thus evident that in actual practice the sizes of potatoes in the different grades vary considerably. This is due to grading by different individuals, variation in the demand of different places and the absence of any definite standards.

In the Bombay Presidency, the merchants sort out all rotten or damaged potatoes (see plate facing page 100). Then they either sell the produce as a mixed lot or divide it into 2 or 3 grades according to size. This practice is followed in Poona and Mahableshwar. At the latter place, where greater importance is attached to size, two varieties—*Italian Long* and *Mombassa Kidney*—are generally sorted out into 3 grades as given below :—

*Italian Long :*

- (1) Big— $2\frac{1}{2}$ " to  $2\frac{3}{4}$ " long.
- (2) Medium—2" to  $2\frac{1}{4}$ " long.
- (3) Small—Less than 2" long.

*Mombassa Kidney :*

- (1) Big— $2\frac{1}{4}$ " to  $2\frac{1}{2}$ " long.
- (2) Medium— $1\frac{1}{4}$ " to  $1\frac{1}{2}$ " long.
- (3) Small—1" long.

However, the sizes are not fixed and standardised. According to the estimate of a local merchant at Mahableshwar, the normal proportion of tubers of different classes is as under :—

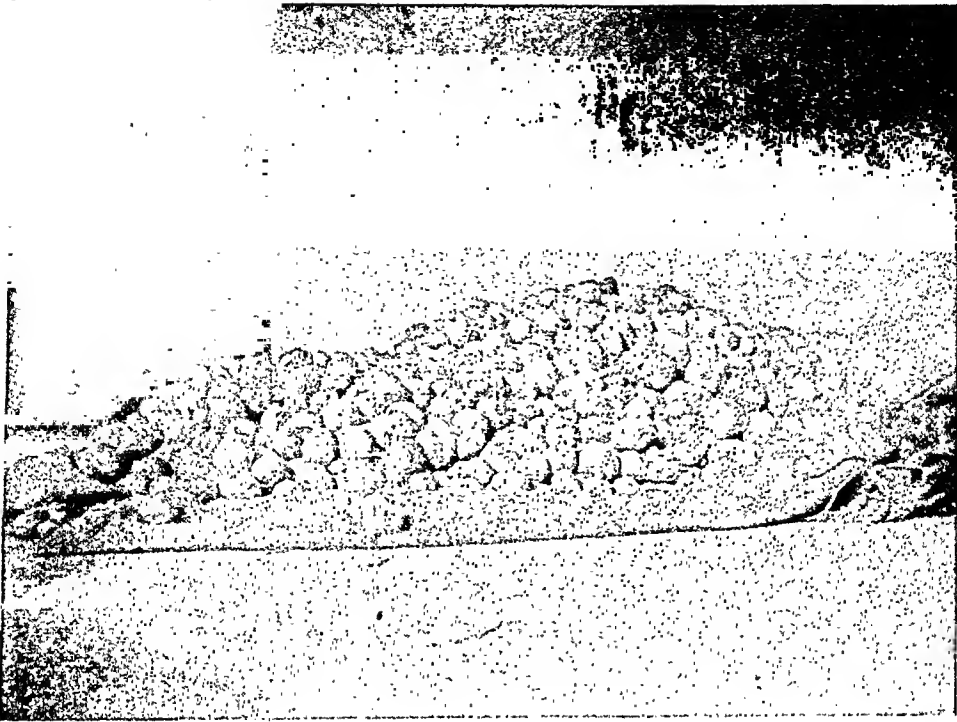
Variety.	Class.	Percentage of the total produce.
Italian Long . . . . .	Big . . . . .	30
	Medium . . . . .	60
	Small . . . . .	10
Mombassa Long . . . . .	Big . . . . .	20
	Medium . . . . .	70
	Small . . . . .	10

## (4) RETAILERS.

After buying the produce, retailers grade it into different sizes. This is a common practice all over the country. There are no fixed standards, and every green grocer or shopkeeper is guided by his own judgment. Generally he divides the produce into big, medium and small (see plate facing page 101) and sells each lot at different prices.

In Burma, apart from picking out badly cut and diseased potatoes in the producing areas and the sorting of some small ones for seed purposes in the Southern Shan States, no real sorting or grading is done by the growers. Potatoes as taken from the earth are generally brought to the assembling centres for sale and the different types such as *Sitbo*, *Bengala* and *Shan* may or may not be in separate lots. Fortunately, however, potatoes from Myitkyina, Mandalay, Naungkid and Aungban are practically all *Sitbo* and those from Bhamo are mainly *Bengala*. There is, therefore, little possibility of the admixture of the different types in these particular places. Nevertheless, the area towards the east of Aungban (Heho area) in the Southern Shan States produces a mixture of *Sitbo*, *Shan* and *Bengala*.

The different types from Heho, may or may not be sent in separate lots. A mixture of *Sitbo*, *Shan* and *Bengala* in the approximate ratio of 2 : 2 : 1 constitutes a grade which is known in the trade as *Heho Mixed*. In times of active demand, this may command a price equal to pure *Sitbo*. For the Calcutta market, *Aungban*, *Sitbo* and *Heho Mixed* may even be mixed in equal proportions at Rangoon and the whole lot sold as *Aungban* quality.



SKINNED-OFF, IMMATURE TUBERS.



POTATOES BEING SORTED IN THE MARKET.





POTATOES SORTED INTO DIFFERENT SIZES BY A RETAILER.

### C.—Possibilities of adopting standard grades and packages.

In the absence of definite grades and standards, it is very difficult to compare the prices in different markets and the importers and exporters have to take great risk in taking action on the basis of prices communicated to them by their agents. In India, potatoes are not graded in a systematic manner. Some sort of grading is attempted at certain places as explained earlier. Not only are the standards different in different markets, but also they cannot be relied upon. The position is worse in the case of seed potatoes, because factors such as the presence of other varieties and of diseased tubers, the condition of the tubers, etc., are of great importance in their case. The ultimate yield largely depends upon the quality of seed potatoes planted. Personal inspection is, therefore, necessary before transacting business, particularly in the case of seed potatoes. This practice leads to tremendous waste of money and time. In view of these facts, the grading of potatoes both for table and seed purposes, according to definite quality, size, shape, colour, presence of tubers of varieties of other descriptions and the existence of extraneous matter, is absolutely essential.

The need for graded produce is felt all over the country and requests for help in grading under statutory regulations have been received from big dealers and growers from different parts of the country. Tentative grades for seed potatoes produced in Bihar and Bengal and for table potatoes produced in the Nilgiri Hills have been drawn up (see Appendices XIX and XX) under the Agricultural Produce (Grading and Marking) Act, 1937. Potatoes were actually graded in 1939 in accordance with these grades. The grading work was undertaken by an association of potato growers and grower merchants at Bihar Sharif. The grading station was opened on the 1st September, 1939, and was closed on 31st of October when the season of marketing of seed potatoes was over. Grading of seed potatoes was done on the basis of size and other factors, such as viability of tubers, presence of tubers of other varieties, blemish, etc. The total quantity of potatoes handled at this station amounted to 7,334 maunds. The increase in the prices of the graded produce over the ungraded in the case of *Phulwa*, *Satha* and *Lal (Darjeeling Red)*, the three main commercial varieties, was 9.3 per cent, 9.0 per cent and 5.7 per cent respectively. The very first experiment created a substantial demand amongst the buyers for the graded produce, with the result that some of the merchants in Patna have now applied for permission to grade their seed potatoes under the AGMARK scheme. In the season of 1940 grading was being done by three merchants including the association at Bihar Sharif.

The grading of potatoes for table purposes was first started in 1939 at Mettupalaiyam, which is one of the largest potato markets in India. The grading work was undertaken by merchants and the Nilgiri District Agricultural Co-operative Sale Society. Grading of the table potatoes is mainly based on the size of tubers. Factors such as the presence of tubers of other varieties and of diseased, cut and damaged tubers are also taken into consideration. In all, about 11,843 maunds of potatoes were graded and on an average a premium of 3.7 per cent was realised for the graded produce. Requests for grading the produce on the above lines have been received from potato dealers in the United Provinces and the Central Provinces and it is hoped that the grading of both seed and table potatoes will soon be taken up there also. At Mettupalaiyam, in the year 1940, the number of merchants grading, increased from three to five. Another merchant at Calcutta has also taken up grading work this year.

These few instances clearly show the great possibilities of introducing standard grades both for the seed and table potatoes. The Agricultural Produce (Grading and Marking) Act, 1937, provides for a voluntary system of grading and any one desirous of grading potatoes can obtain, on application, a Certificate of Authorisation from the Agricultural Marketing Adviser to the Government of India. The conditions attached to the issue of the Certificate are given in Appendix XXI.

The standardisation of packages is also very important. Gunny bags are commonly used for potatoes but the quantities filled in vary from place to place. A bag may contain from 2 to 2½ maunds of potatoes. Because of this great variation, the produce has actually to be weighed in most transactions. This not only means unnecessary expenditure but the extra handling also affects the keeping quality of the produce. When potatoes are sold on a bag basis there are generally disputes about weight. In order to avoid weighing at every stage when the produce changes hands it is desirable to fix the weight of the contents of a bag and put proper marks and brands on it. As there is some loss in weight during transit, the weight at the time of packing should be noted on the label.

Seed potatoes being more delicate cannot be safely transported in bags, particularly those potatoes which are preserved for a long period as is the case in Bihar and the United Provinces. At present they are usually packed in baskets of about 35 lb. capacity. The quantity packed per basket in actual practice varies from 30 to 40 lb. It would, therefore, be desirable to fix the quantity which may be packed in a basket.

#### **D.—Grades and standards prevalent in other countries.**

The grading of the produce has been taken up in most of the important potato producing countries. The success is particularly noteworthy in the United States of America, Canada, Germany and Netherlands.

The grade requirements of potatoes are conditioned by the differences in size, shape and qualities of the tubers, the number of varieties and the presence of dirt and diseased or damaged tubers in a consignment. In a large number of countries the grading of the produce was first attempted and this was followed by the adoption of standard packs and packages having distinctive names or brands. In some countries, however, the standardisation of packs and packages was started simultaneously.

The standardisation work may be administered by three agencies, *viz.*, the State, producer's organizations—trading or non-trading—and commercial organizations. The adoption of standard grades and packs laid down by the State may be voluntary or compulsory. In the United States of America, the adoption of standardisation is voluntary, excepting in one State where it is compulsory. In Canada, it is compulsory to grade the potatoes according to the recognised grades. The voluntary system of grading, however, prevails in most of the countries.

Standardisation has been an important contribution of the large scale co-operative organisations in North America. Not only were some of these organisations pioneers in the establishment of grades, but, since special grades have been promulgated, they have also been most active in applying them. Examples of such large organizations are: The Michigan Potato Growers' Exchange (America), the Colorado Potato Growers' Exchange (America) and the Prince Edward Island Potato Growers' Association (Canada). In other cases, where such large organizations do not exist, the growers' regulatory organizations representing the growers, as in the case

of the German Mark Potato Association, or growers, traders and the State, as in the Dutch Export Control Bureau, have been prominent in establishing the standard grades and packages for voluntary use. The standards have generally the sanction of official or semi-official bodies.

As regards the place where grading is undertaken, the practice differs from area to area. At some places, the work is done on the farms and in others at the shipping points. In the case of seed potatoes, the bulk of the preparation for market is usually done on the farms. For example, in the Netherlands, the Central Committee for Crop Inspection is not only responsible for the inspection of the harvested produce, but the members are also required to inspect the growing crop in the field. After declaring the soundness of seed tubers, the Committee applies necessary labels and seals or issues certificates specified for that purpose. Other organizations, such as the Eastern Shore of Virginia Produce Exchange (America) have appointed regional inspectors who supervise the work of the loading-point graders. Grading, as carried out on the farms, has proved most economical. It saves the unnecessary expense on the unwanted potatoes which could easily be disposed of at the farm.

As regards the mark or brand, each country adopts a distinct trade mark. The presence of this mark on the standard package increases the confidence of the public in the contents of the package and also helps in tracing the origin of the produce. A brief description of the standards of grading in vogue in different countries is given below :—

#### (1) UNITED KINGDOM.

The grading of potatoes in England is of recent origin. It was only in 1929 that the Ministry of Agriculture and Fisheries, in consultation with the interests concerned defined under the Agricultural Produce (Grading and Marking) Act, 1928, three statutory grades for voluntary use, *viz.*, E. & W. No. 1, E. & W. No. 2 and E. & W. No. 3 (see Appendix XXII). A common standard is established for all the three grades in respect of the presence of diseased, damaged, undersized or oversized tubers, earth and other foreign matter. The grades differ only in respect of the minimum diameter of the potatoes, which means that all potatoes of any statutory grade must pass over a riddle of specified mesh.

Standardisation of packages also is not strictly carried out. 1 cwt. sacks are commonly used for the home-grown crop. They may be returnable or non-returnable. Home-grown potatoes from the early crop are marketed in a great variety of containers which do not have any uniformity in size, weight or mark.

#### (2) UNITED STATES OF AMERICA.

Grading according to accepted specifications is widely practised in the United States of America. Many shipping organizations and co-operative associations have voluntarily set up their own grades and have employed their own inspectors for inspecting the grading technique. The standard grades promulgated by Truax of the Bureau of Markets provide for three grades, *viz.*, U. S. Grade Fancy, U. S. Grade No. 1 and U. S. Grade No. 2. Their requirements are as follows :—

“ *U. S. Grade Fancy.*—This grade shall consist of sound potatoes of one variety which are mature, bright, smooth, well shaped, free from dirt or other foreign matter, frost, injury, sunburn, second growth, growth cracks, cuts, scab, blight, soft rot, dry rot, and damage caused by disease, insects, or by mechanical or other means. The range in size shall be stated in terms of

minimum and maximum diameter or weight following the grade name,\* but in no case shall the diameter be less than two inches.

In order to allow for variations incidental to commercial grading and handling, five per centum by weight of any lot may vary from the range in size stated, and, in addition, three per centum by weight of any such lot may be below the remaining requirements of this grade ; but not more than one-third of such three per centum, that is to say, not more than one per centum by weight of the entire lot, may have the flesh injured by soft rot."

"U. S. Grade No. 1.—This grade shall consist of sound potatoes of similar varietal characteristics which are practically free from dirt or other foreign matter, frost injury, sunburn, second growth, growth cracks, cuts, scab, blight, soft rot, dry rot, and damage caused by diseases, insects, or mechanical or other means.

The diameter of the potatoes of the round varieties shall not be less than one and seven-eighth inches, and of potatoes of long varieties one and three-fourth inches.

In order to allow for variations incidental to commercial grading and handling, five per centum by weight of any lot may be under the prescribed size, and, in addition, six per centum by weight of any such lot may be below the remaining requirements of this grade ; but not more than one-third of such six per centum, that is to say, not more than two per centum by weight of the entire lot, may have the flesh injured by soft rot."

"U. S. Grade No. 2.—This grade shall consist of potatoes of similar varietal characteristics, which are practically free from frost injury and soft rot, and which are free from serious damage caused by sunburn, cuts, scab, blight, dry rot, or other diseases, insects, or mechanical or other means.

The diameter of potatoes of this grade shall not be less than one and one-half inches.

In order to allow for variations incidental to commercial grading and handling, five per centum by weight of any lot may be under the prescribed size, and, in addition, six per centum by weight of any such lot may be below the remaining requirements of this grade ; but not more than two per centum by weight of the entire lot, may have the flesh injured by soft rot."

The U. S. No. 1 and U. S. No. 2 are in general use and their requirements are tabulated below :—

Grade.	Minimum diameter.	Tolerance for undersize.	Tolerance for defects.	Tolerance for soft rot, decay and other defects.	Frost injury and decay.	Second growth, growth cracks and badly misshapen.	Extraneous matter, sunburn, hollow cuts, scabs, blight, dry rot, damage by insects or mechanical means.
	(Inches)	Per cent.	Per cent.	Per cent.			
U. S. No. 1	1 7/8 round	5	6	2	Free	Free	Free
U. S. No. 2	1 3/4 long 1 1/2	5	6	2	Free	No restriction	Free from serious damage

\* Such statements as the following will be considered as meeting this requirement : "U. S. Grade Fancy, 2 to 3 inches", "U. S. Grade Fancy, 10 to 16 oz.", "U. S. Grade Fancy, 2 inches and larger", "U. S. Grade Fancy, 10 oz. and larger".

The grading was made compulsory during the period 1917-18, when the Food Administration compelled large handlers of potatoes to undertake grading according to certain prescribed standards. This policy was strongly opposed in certain areas. The objections of the growers to potato grading rules have been overcome and the growers are now strongly in favour of grading which is a widespread practice in most of the States.

### (3) CANADA.

Under the Root and Vegetable Act, 1922, the Canadian Ministry of Agriculture regulates the grades of ware potatoes. The Act lays down the following grades :—

(1) Canada "A" includes only sound and reasonably mature potatoes of similar varietal characteristics which are practically free from dirt or other foreign matter, frost injury, rot or damage caused by disease, insects, mechanical or other means. In this grade, the diameter of potatoes of round varieties shall not be less than  $1\frac{7}{8}$  inches, and of the long varieties  $1\frac{3}{4}$  inches.

(2) Canada "B" quality is similar to Canada "A", but of a diameter not less than  $1\frac{1}{2}$  inches.

(3) Canada "C" ungraded quality shall include only potatoes of  $1\frac{1}{2}$  inches or more in diameter.

In grades "A" and "B", 5 per cent may be under-size and to allow for variations incidental to commercial grading and handling, another 6 per cent may be below other requirements of the grade but not more than 2 per cent of the entire lot may have the flesh injured by soft rot. The rules also state that all graded potatoes should be "free from serious damage" and that the grade and the name of the packer should be clearly written on the package. All potatoes should be sold by weight except when offered for sale in closed barrels. New potatoes from June to September, seed potatoes and potatoes for export are excluded from the Act.

### (4) GERMANY.

The German Potato Trade Federation acts as the governing body in the potato trade. Regulations are framed by a conference of the growers, the traders and a representative of the Chamber of Agriculture. District Arbitration Boards are established by the Federation. All types of disputes are settled by competent and expert arbitrators of the Board.

The Federation has drawn up a complete set of rules governing the delivery, loading, weight, etc., of the consignments. Only the clean and sound potatoes are to be delivered. The presence of earth up to 2 per cent is ignored : from 2 to 6 per cent allowance is made in the price ; but if the earth exceeds 6 per cent the buyer can claim to have the whole weight of the earth and the freight thereon made good. Regulations have also been provided for seed potatoes, and factory and feeding potatoes. For example, in the case of seed tubers, the seller must produce, if the buyer desires, an official certificate about variety, origin, etc. The stock must be pure, 1 per cent of other varieties being the extreme limit of impurity. Sizes allowed are 3 to 4 centimetres for round varieties, and 8 to 9 centimetres for the long ones. Faults under this head are permitted up to 5 per cent. If the percentage of the damaged potatoes exceeds 4 per cent or if there is any other deviation from the specifications beyond 4 per cent, the buyer can refuse to accept the consignment. Factory potatoes are delivered unsorted as they come off the field. Except when there is a special written contract to the contrary, potatoes delivered contain at least 14 per cent of starch.

## INTER-CHAPTER FIVE.

Standardisation is one of the most important principles of modern commerce. It helps the collection and dissemination of market information and enables goods to be sold on the basis of their description. Graded goods can be readily bought or sold without any preliminary inspection.

In India at present, potatoes have to be personally examined for the purpose of finding out the proportion of diseased, damaged and unripe tubers before they can be purchased. This entails loss of time and money and adds to the cost of the produce. There is, therefore, need for the grading of potatoes both for table and seed purposes. Without definite and reliable standards it is also difficult to compare accurately the price levels in different markets.

At present, isolated attempts at some rough sorting and grading are made by different agencies engaged in the distribution of the produce. The standard of grading, however, varies in different localities and with different traders. For example, in certain areas growers sort out only the very small, diseased and damaged potatoes before taking the produce to the market; in others, they sort it into as many as three or four grades.

Growers do not generally take any important part in the grading of their produce. In Bihar, Bombay, Madras, the Central Provinces and Orissa, however, they sort out the rotten and badly damaged potatoes. Sometimes, as in Bombay and Madras, they go a step further and separate all potatoes which are green or below  $\frac{1}{2}$ " diameter. Sorting done by the cultivator is never properly done and has to be done over again in the market under the supervision of the commission agent.

In the United Provinces, cultivators sort out damaged, rotten and very small tubers and also those suitable for seed purposes. The rest of the produce is sold mixed. In Farrukhabad, where large quantities of potatoes are retained for seed purposes, the sorting is done a little more carefully. Potatoes from  $\frac{1}{4}$ " to 1" in diameter are selected for seed purposes and are classed as *Manjholā*, i.e., medium. Those left over are called *Chhote* i.e., small, and are utilised for domestic consumption. The seed potatoes are further graded into  $\frac{1}{4}$ ",  $\frac{1}{2}$ ",  $\frac{3}{4}$ " and 1" sizes at the time of planting, as different sizes are in demand in different markets. In the hills, cultivators sort out seed potatoes for their own use, the rest of the produce being sent mixed to the

assembling markets. In some parts, however, growers do not sort their produce at all.

In Belgaum in the Bombay Presidency, growers pay considerable attention to the grading of their produce. As soon as the crop is harvested, the damaged and rotten tubers are removed and the rest of the produce is roughly divided into four grades :—

- (a) I Grade—Tubers more than 3" in diameter.
- (b) II Grade—Tubers with a diameter of 2" to 3".
- (c) III Grade—Tubers with a diameter of  $1\frac{1}{2}$ " to 2".
- (d) IV Grade—Tubers less than 1" in diameter.

Potatoes of grades I and II are sold soon after the harvest for table purposes and those of grades III and IV are usually retained for seed purposes.

Producers in Bihar also grade their produce in a rough manner. One lot consists of tubers of about  $1\frac{1}{4}$ " in diameter and above and is sold for table purposes. The other lot consists of those below  $1\frac{1}{4}$ " in diameter and is retained for seed purposes. As far as size is concerned, the grading of seed potatoes is done very efficiently in Bihar, but other factors such as freedom from diseases, proportion of tubers of other varieties and viability of the tubers are rarely taken into account.

In the Punjab, particularly in the Simla Hills, some rough grading is done and the produce, before being taken to the market, is sorted into two classes, *Phool* and *Roshan*, according to size. If village merchants cannot do it themselves, they get it done by a commission agent who usually charges six pies per maund for this work.

Wholesale merchants and commission agents all over the country generally grade potatoes in a rough and ready manner, mainly according to size. There are no fixed and recognised standards. They generally take out the rotten potatoes and then the healthy ones are sorted out into two or three sizes, *i.e.*, big, medium and small. These terms are arbitrary and there are no definite standards by which they could be defined. Potatoes graded as big on one day may be graded as medium on another. The standards of grading in the Dehra Dun, Mettupalaiyam, Simla and Kalka markets and in some of the markets in the Bombay Presidency are more or less recognised by the trade and definite trade names have been given to potatoes of different sizes. In the Dehra Dun market, potatoes are sorted out into three grades ;



namely, *Phool*, *Gud* and *Charri*. Big selected tubers of over one inch in diameter are classed as *Phool*, those of  $\frac{1}{2}$ " to 1" as *Gud* and less than  $\frac{1}{2}$ " as *Charri*. At Mettupalaiyam, the produce is sorted out into a number of grades. The tubers of the *Royal Kidney* variety are sorted into five grades, i.e., *Kidney*, *Medium*, *Rasi*, *Podi* and *Small Podi*. The largest tubers measuring 3" to  $3\frac{1}{2}$ " in length and  $1\frac{3}{4}$ " to 2" in diameter, free from blemishes and of good colour are classed as *Kidney*. Tubers  $2\frac{1}{2}$ " to 3" long and  $1\frac{1}{4}$ " to  $1\frac{1}{2}$ " in diameter are classed as *Medium*. Those  $1\frac{1}{2}$ " to  $2\frac{1}{2}$ " in length and  $1\frac{1}{4}$ " to  $1\frac{5}{8}$ " in diameter and of average quality are classed as *Rasi* and the small ones  $\frac{3}{4}$ " to 1" in diameter are classed as *Podi*. These latter are sometimes further subdivided into *Podi* and *Small Podi*. All the diseased and damaged tubers are classed as *Thallu* i.e., rejections. Soft immature tubers with ruptured skin are classed as *Skinned-off*. Tubers of the *Great Scot* variety are sorted into a mixture of round and large size ( $2\frac{1}{2}$ " to 3" in diameter) known under the trade name of *Round*. In this lot, a small proportion of tubers of  $1\frac{1}{2}$ " in diameter is also allowed.

Potatoes of different grades are sent to different places according to demand, e.g., *Round* to Bombay and Colombo; *Large Kidney* to Calcutta; *Medium* to the different district towns in the Madras Presidency; and *Skinned-off* to Calicut and Tellicherry. *Podis* are mostly consumed locally or sometimes sent to small towns. Although the foregoing rough classification is recognised in the trade, yet variations occur from market to market. Sometimes, therefore, potatoes sent out from Mettupalaiyam are re-sorted in the wholesale consuming markets.

Very often tubers of different grades are found mixed in the same consignment. For example, in one consignment sold as *Kidney*, 58·0 per cent of the tubers were of real *Kidney* class, 30·0 per cent *Podi*, 7·5 per cent rotten and damaged, 3·0 per cent *Thallu* and 1·5 per cent *Nadu Podi*. In actual practice the sizes of potatoes in the different grades vary considerably. This is due to grading being done by different individuals, variation in the demand of different places and the absence of any definite standards.

After buying the produce, retailers grade it into different sizes. There are no fixed standards, and every green grocer or shopkeeper is guided by his own judgment. Generally he divides the produce into big, medium and small and sells it at different prices.

In Burma, apart from picking out badly cut and diseased potatoes in the producing areas and the sorting of some small ones for seed purposes in the Southern Shan States, no real sorting or grading is done by growers. Potatoes taken from the earth are generally brought to the assembling centres for sale and the different types such as *Sitbo*, *Bengala* and *Shan* may or may not be sold in separate lots.

In the absence of definite grades and standards it is very difficult to compare prices in different markets and importers and exporters take great risk in taking action on the basis of prices communicated to them by their agents. Not only are the standards different in different markets, but they cannot also be relied upon. The position is worse in the case of seed potatoes, because factors such as the presence of other varieties and of diseased tubers, the condition of the tubers, etc., are of great importance in their case. The ultimate yield of the crop largely depends upon the quality of seed potatoes planted. Personal inspection, therefore, becomes all the more necessary in the case of seed potatoes.

The need for graded produce is keenly felt and requests for help in grading under statutory regulations have been received from big dealers and growers all over the country. Tentative grades for seed potatoes produced in Bihar and Bengal and for table potatoes produced in the Nilgiri Hills have been drawn up under the Agricultural Produce (Grading and Marking) Act, 1937. Potatoes were actually graded in 1939 in accordance with these grades. The grading work was undertaken by an association of potato growers and grower-merchants in Bihar Sharif. The total quantity of potatoes handled at this station amounted to 7,334 maunds. The increase in the prices of the graded produce over the ungraded in the case of *Phulwa*, *Satha* and *Lal (Darjeeling Red)*, the three main commercial varieties, was 9.3 per cent, 9.0 per cent and 5.7 per cent respectively. The very first experiment created a substantial demand amongst buyers for the graded produce, with the result that some of the merchants in Patna have now applied for permission to grade their seed potatoes under the AGMARK scheme.

The grading of potatoes for table purposes was first started in 1939 at Mettupalaiyam, which is one of the largest potato markets in India. The grading work was undertaken by merchants and by the Nilgiri District Agricultural Co-operative Sale Society. In all, about 11,843 maunds of potatoes were graded and on an average a premium of 3.7 per cent was realised for the graded produce. Requests for grading the produce

on the above lines have been received from potato dealers in the United Provinces and the Central Provinces and it is hoped that the grading of both seed and table potatoes will soon be taken up there also.

The standardisation of packages is also very important. Gunny bags are commonly used for transporting potatoes, but the quantities filled in vary from place to place. A bag may contain anything from 2 to  $2\frac{1}{2}$  maunds of potatoes. Because of this great variation, the produce has actually to be weighed in most transactions. This means unnecessary expenditure and the extra handling also affects the keeping quality of the produce. When potatoes are sold on a bag basis there are numerous disputes about weight. In order to avoid weighing at every stage when the produce changes hands, it would be better to fix the weight of the contents of a bag and put proper marks and brands on it. As there is a likelihood of some loss in weight during transit, the weight at the time of packing should be noted on the label.

Seed potatoes being more delicate cannot be safely transported in bags, particularly those which are preserved for a long period. At present they are usually packed in baskets of about 35 lb. capacity. The quantity packed per basket in actual practice varies from 30 to 40 lb. It would, therefore, be desirable to fix the quantity which should be packed in a basket.

The grading of the produce has been taken up in most of the important potato producing countries and been attended with success particularly in the United States of America, Canada, Germany and the Netherlands.

Grade requirements of potatoes are conditioned by differences in size, shape and quality of the tubers, the number of variations and the presence of dirt and diseased or damaged tubers in a consignment. In most countries the grading of the produce was attempted first and this was followed by the adoption of standard packs and packages having distinctive names or brands. In some countries, however, the standardisation of packs and packages was done simultaneously.

Standardisation has been an important feature of the work of the large scale co-operative organizations in North America. Some of these organizations were pioneers in the fixing of grades.

In other cases, where such large organizations do not exist, growers' regulatory organizations representing the growers, as in the case of the German Mark Potato Association, or growers,

traders and the State, as in the Dutch Export Control Bureau, have taken steps to fix the standard grades and packages. These standards have generally had the sanction of official or semi-official bodies.

Grading is done either on the farms or at the shipping points. In the case of seed potatoes, the bulk of the preparation for market is usually done on the farms. For example, in Netherlands, the Central Committee for Crop Inspection is not only responsible for the inspection of the harvested produce, but members are also required to inspect the growing crop in the field. After declaring the soundness of seed tubers the Committee applies necessary labels and seals or issues proper certificates. Other organizations, such as the Eastern Shore of Virginia Produce Exchange (America), have regional inspectors who supervise the work of loading-point graders. Grading, as carried out on the farms, has proved most economical. It enables unwanted potatoes to be easily disposed of on the farm.

As regards the mark or brand, each country adopts a distinct trade mark. The presence of this mark on the standard package inspires the confidence of the public in the contents of the package and also enables purchasers to trace the origin of the produce.

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## CHAPTER VI.—ASSEMBLING.

## A.—General.

Assembling implies the bulking of the farm produce prior to its distribution. Where the producing areas are at long distances from the consuming centres, assembling economises substantially the cost of marketing, particularly the cost of transport. In view of the fact that India is a country of small holdings and that the acreage under potatoes is limited and scattered, the assembling of the produce presents a problem of great economic importance. The large producing centres lie at considerable distances from the consuming markets. (The map facing page 114 shows the important assembling and consuming markets). It is not, therefore, as a rule, convenient or possible for the cultivators and consumers to meet and arrange direct sales. This being the case, there have arisen two broad classes of wholesalers in the potato trade who act as a connecting link between the producing and the large consuming areas. One set of wholesalers consists of those merchants who operate mainly in the producing areas, and are primarily engaged in buying potatoes from the growers and arranging despatches to the consuming centres. Such wholesalers are either village merchants or itinerant merchants or representatives of commission men and wholesalers in consuming markets, or sometimes the growers themselves. They may be said to perform the functions of collecting and assembling the produce from several petty growers. The other class of wholesalers consists of those merchants who operate in the large consuming centres and are concerned with the distribution to retail traders. (The diagram facing page 115 shows the main channels of assembling the produce).

## B.—Assembling agencies.

The potatoes are assembled by the following agencies :—

- (1) Producers.
- (2) Village merchants.
- (3) Itinerant merchants.
- (4) Manure merchants.
- (5) Wholesale merchants and commission agents.
- (6) Producers' co-operative societies.

## (1) PRODUCERS.

The growers, as a rule, want to market the produce themselves but, in actual practice, the opportunity for doing so varies in different tracts according to the financial position of the cultivators and transport facilities. Very often, they are bound by advances which they have already received from the village merchants, commission agents or manure merchants. In such cases, they have no option but to sell the produce to their creditors on the farm itself or in the local assembling markets. Sometimes, as in Upper Assam districts and the Patiala State, they may sell the crop long before it is ready for harvesting. In such cases, the buyers attend to the harvesting operation. The practice of receiving advances, either in cash or in the form of seed, is common in all the potato producing areas. It is particularly so in Bengal, Bombay, Madras, Punjab, Sind and Mysore State. When the advance is received from a commission agent, the potatoes are usually taken to his godown and he arranges for the sale. If there are no buyers, the commission agent buys the produce himself.

In the United Provinces, Bihar, Punjab and Sind, the cultivators in the plains usually take the produce to the assembling markets and sell it through the commission agents. In certain cases, however, the produce is sold on the farm to the village merchants or the itinerant traders who may be working either independently or on behalf of commission agents in the consuming markets. In the hilly tracts of the United Provinces and in the Punjab, on account of transport difficulties, the cultivators sell their produce in their villages either to the village merchants or to the itinerant buyers. Personal obligations of the growers to the *dukandar* (village shopkeeper) also play a part in selling the produce in villages to some extent. Usually, the growers buy their general household requirements on credit from the village merchants and the accounts are settled through the sale of the produce after harvest.

In Assam, Bengal, and Orissa, the potatoes are brought by the growers to the local *hats*, where they are sold to the wholesale buyers. In Assam, small weekly *hats* are held in different parts of the producing areas where the local merchants buy the produce direct from sellers, and later take it for sale to the exporters' godowns at Shillong.

In the Bombay Presidency, the growers sell the produce either in the assembling markets or in the villages to the travelling merchants. The extent to which the produce is sold through different agencies varies from one centre of production to another. In the Poona district, for example, about 45 per cent of the produce is sold in the local wholesale market, 50 per cent in the villages, and 5 per cent in the local bazárs. In Nasik and Ahmednagar districts, however, two-third of the produce is sold in the local weekly bazárs and only one-third to merchants in the villages. In the province as a whole a large part of the produce is assembled by the growers themselves either in the wholesale assembling markets or in the bazárs. The system of sales to the visiting merchants is more common in the Poona district.

In the Madras Presidency, 80 to 95 per cent of the produce is assembled by the producers at the Mettupalaiyam market, and the remainder in different centres in the hills from where it is distributed by the local wholesalers to various markets. Some of them, however, also sell the produce in their villages to the visiting merchants, who may either be the agents of the Mettupalaiyam merchants or be wholesalers themselves. There is recently an increasing tendency amongst the growers to sell the produce in the villages as this saves them the trouble of going to Mettupalaiyam. When the latter course is adopted, they have to sell it at the prices offered as they cannot afford to wait indefinitely. But in the villages, they need not sell if the price offered is not reasonable. This system of sale works successfully when there is a number of buyers going about from one village to another for making purchases. If the prices in the consuming markets are high, a large number of buyers, instead of waiting for the produce to come down to Mettupalaiyam, themselves go to villages and buy the produce directly from the producers. They, however, do not do so when the market is dull, and the growers, who want to dispose of their produce, have to take it to Mettupalaiyam.

It is evident from the above account that the work of assembling the produce undertaken by the cultivators is very limited. The varied duties of the cultivator, the complicated market practices and the lack of transport facilities are some of the factors responsible for the selling of the produce by the cultivator in his own village.

In Burma, in Myitkyina and Bhamo, the potato growers, who are mostly Gurkhas and Sino Shans, get loans of seed and money at the time of sowing their crop. At harvest, they have to settle their accounts from the sale proceeds and the traders take away the whole of the produce. The growers, therefore, take no part in assembling. Similar conditions prevail in other centres of production. Those who are free from encumbrances also sell it to the visiting agents or to the town traders. As a rule, they do not undertake the assembling of their produce. The conditions in Burma are slightly worse in this respect than in India.

## (2) VILLAGE MERCHANTS.

The village merchant combines the duties of a petty shopkeeper, provision merchant, money lender and trader. He advances money to cultivators at the time of planting and also gives them provisions on credit. He receives the payment generally in the form of produce. He usually deals with petty growers who have generally no direct approach to the big commission agents in the assembling markets. At the harvest time, he collects the produce of his debtors and others and takes it for sale to the assembling market. The village merchants play an important part in assembling the produce in the Punjab, Bengal and Assam, but not to such an extent in other areas.

The village merchant buys the produce either directly from the producer or in a local *hat* as in Assam and Bengal. When a considerable quantity has been purchased, he proceeds to the neighbouring assembling market and sells his stock through a commission agent. At times, village merchants sell their stock in the same village either to the visiting wholesalers or to the itinerant traders. In the hilly tracts of the Punjab and Assam, the village merchants keep their own pack animals for carrying the produce to the assembling markets. But this system is not very common. Sometimes, particularly in the case of debtor cultivators, the village merchant goes to his clients at the time of harvest and takes possession of the produce at the farm, and arranges for its transport to his shop or house.

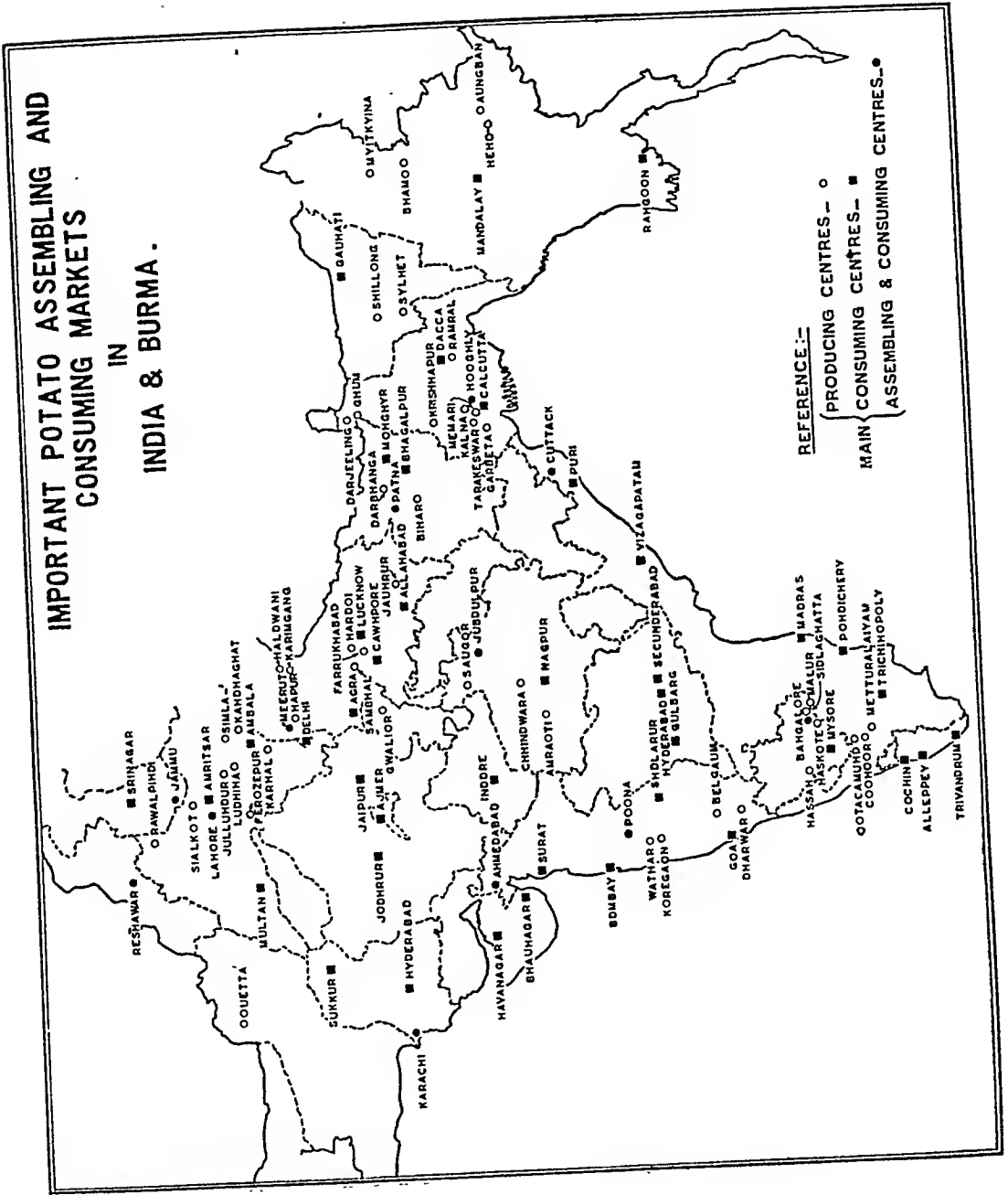
In some parts, such as the Poona district in Bombay Presidency, and Nilgiri Hills in Madras, the village merchants do not buy the produce themselves, but act as brokers for the visiting merchants. They take the latter to their cultivator clients and settle the terms between them. The payment is made through the broker who deducts his commission, which varies from two to four annas per bag, before handing over the proceeds to the cultivator.

## (3) ITINERANT MERCHANTS.

The itinerant dealers are petty merchants who usually carry on their trade in several villages, buying potatoes and transporting them to the nearest wholesale or assembling markets for resale. They are either the traders who come from the adjoining towns or the village merchants who operate beyond the jurisdiction of their own villages. They are known by various names such as *beoparis*, *banjaras* and *kochias*. Most of these merchants handle all types of farm produce including potatoes. They are commonly met with in the Punjab, Central Provinces, Bihar, United Provinces, Bengal and Assam.

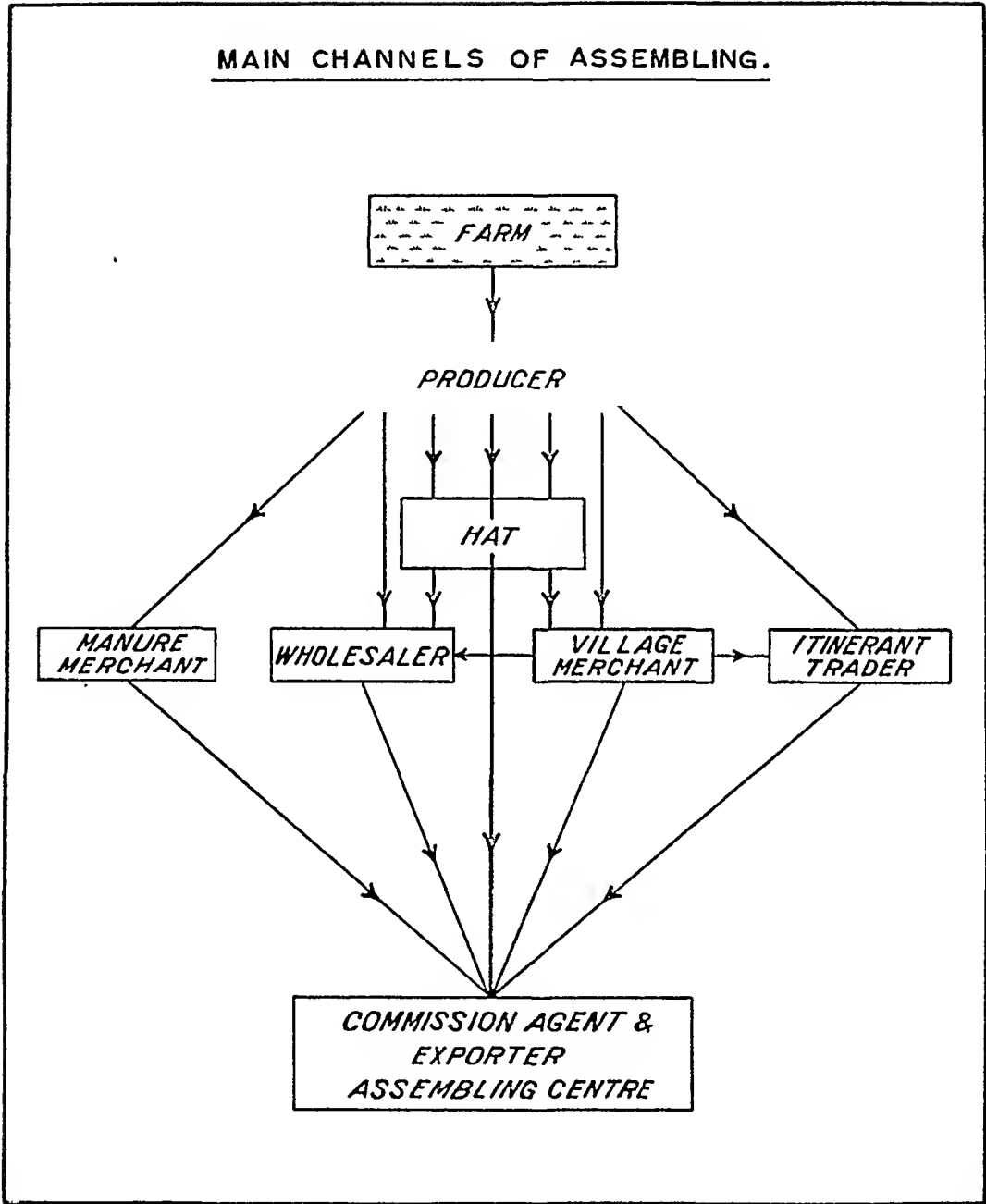
In the United Provinces, the itinerant merchants operate mainly in the hills. They buy provisions such as *gur*, sugar, tea, cloth, etc., from places such as Haldwani and Nainital, and take them for sale to the villages in the interior of the hills where potatoes are grown. While going about in the villages, they buy potatoes either directly from the producers or from the village merchants

# IMPORTANT POTATO ASSEMBLING AND CONSUMING MARKETS IN INDIA & BURMA.





MAIN CHANNELS OF ASSEMBLING.



and after they have collected a sufficiently large quantity they return to Haldwani or Nainital where they sell the same through the commission agents. Sometimes, they take the potatoes to non-producing villages and sell them to the village merchants or directly to the consumers.

#### (4) MANURE MERCHANTS.

The manure merchants who take part in the assembling of potatoes are found only in the Nilgiri Hills in the Madras Presidency. They take manure from the agents of the artificial manure concerns at Ootacamund or Coonoor and advance it on credit to the growers, realizing the price at harvest time after the produce has been sold. They charge Re. 1 to Rs. 1-8-0 per bag over and above the current prices, which is equivalent to 33 to 50 per cent interest per annum. Sometimes, instead of waiting for the cultivators to sell their produce, they themselves take it to Mettupalaiyam for sale, charging a commission of 8 annas per bag of 200 lb. *plus* actual charges on transport. Their activities are increasing every year.

#### (5) WHOLESALE MERCHANTS AND COMMISSION AGENTS.

Amongst this class of dealers are included both the wholesale merchants and the commission agents who do wholesale business. The latter usually advance loans to the cultivators either in cash or in kind, on the understanding that the produce will be sold through them. Sometimes, they or their agents visit the producing areas in the season and give further advances to the cultivators to arrange for the transport of the produce to their godowns. This practice is common in Bombay, Bengal, Madras, the Central Provinces and Sind. Wholesalers, who do not advance loans, purchase the produce in the local *hats* as in Assam, Orissa and Bihar or in villages as in the United Provinces, Punjab, Bombay and Madras.

In the villages, the prices are settled either on weight basis or sometimes on the basis of a bag as in the Bombay and Madras Presidencies. In the latter case, the type of bag is usually specified at the time of settling the price. A bag can normally hold  $2\frac{1}{4}$  maunds. But the buyers usually have the bags filled by expert coolies who can put in 10 to 20 per cent more than the normal capacity of the bag. The producers are generally aware of this practice and keep this point in mind when settling the price. It has been observed that the prices paid in the villages in the Manchar area of the Bombay Presidency are 8 annas to Re. 1 per *palla* (210 lb.) more than the prevailing prices in the Manchar market. The wholesalers, however, make a profit even after paying a slightly higher rate as they take 10 to 20 per cent more by filling the bags to their maximum capacity. The ignorant cultivators are sometimes deceived by such devices.

Sometimes, the wholesalers simply settle the price and give an earnest money of Re. 1 to Rs. 5 and take delivery after two or three days. This is done when they are doubtful about the tendency of the prices in the market to which the produce is to be taken. If the prices fall during this interval, the wholesaler goes back to the village and negotiates afresh with the cultivator with a view to induce him to reduce his price in the light of the changed market conditions. He foregoes his earnest money if he fails to get a reduction. This practice is far from satisfactory from the grower's point of view.

In Burma, a major portion of the produce is assembled by the town traders. The methods of assembling are different in different areas.

*Myitkyina and Bhamo areas.*—In view of the fact that the growers are heavily indebted to the traders, the assembling of potatoes in this part of the country is simple. The potato traders (Indians), who have taken up this trade as a side line to their ordinary business of selling provisions, oilman's stores, etc., have their own circle of growers (Gurkhas and Sino Shans) to whom they give loans in the form of seed or money. As soon as the crop is harvested, they go round to the cultivators, inspect the crop and fix a date for receiving the produce. They take gunny bags and fill them with potatoes after discarding the rotten or cut tubers which may constitute about 3 per cent of the produce. A bag of potatoes is taken as 50 viss whereas actually it weighs from 52 to 54 viss. (Viss = 3.6 lb.).

At Bhamo, however, the potatoes are measured with a basket which is reckoned to hold 16 viss. A bag is filled with  $2\frac{1}{2}$  baskets so as to contain 40 viss but, in practice, it weighs as much as 45 to 50 viss. The full bags are then taken away to the railway station or to the steamer pontoon, as the case may be, for consignment to the various distributing centres, of which Rangoon is the most important.

*Northern Shan States.*—Traders operating in this area may be divided into two groups, viz., Burmese and Marwaris. The Burmese group is financed by a Rangoon firm. No interest is charged, but the traders are required to sell their produce through the firm which charges a commission of 4 per cent. The Marwari group has, however, no outside financiers. During the harvest season, these traders remain in constant touch with the growers to whom they issue advances, generally without interest, in addition to the seed potatoes.

At harvest, the traders from both the groups go to the villages and collect the produce. About 20 to 40 per cent of the cultivators are free from debt and they can sell their produce to whomsoever they like. No *swega* or weighing fee is taken as there are generally no brokers acting for buyers or sellers. After stitching, the full bags are conveyed by cart to the godowns where they are emptied for sorting out the damaged tubers before despatch to the distributing markets.

*Southern Shan States.*—The produce of this area is in special demand for export from the middle of June to the end of November. The Burmese Shan sub-brokers and a number of representatives of potato traders of Rangoon gather at Aungban and Heho, the two important assembling markets, and send down shipments for sale on commission either in Rangoon or in Calcutta.

Financing the crop in this area starts with the traders or the brokers. They give advances, free of interest, to the village traders, and also to cultivators for varying periods between the time of preliminary cultivation in April-May up to harvest time in August-September. The customary advances are one or two rupees on each 100 viss of the crop likely to be brought in. The amounts, so advanced, supplemented with the village traders' own money, are lent to the cultivators at the rate of 3 to 5 per cent per mensem on the understanding that a fixed quantity of the produce shall be disposed of through the lender at current rates. Thus the village trader and through him the broker or trader in Heho and Aungban is assured of handling his share of the crop. At harvest, the produce of the pledged cultivators is collected by the village trader in settlement of the money previously paid to him. The potatoes are measured and heaped in empty kerosene oil tins (30 measures are reckoned to make 250 viss; actually the weight is 265 viss). The potatoes are then brought down to

the town-brokers' godowns at Heho or Aungban. Cultivators, who have avoided advance sales or borrowing, may depute one or more of leading growers to take the produce to the brokers.

The town broker acts as an intermediary between the agents of the Rangoon firms, etc., and the sellers. He approaches these agents and informs them of the quantities and qualities of potatoes lying with him for disposal, and gets them to quote a price on samples or bulk examination. This price is communicated to the seller. If he accepts it, empty gunny bags are brought from the buyer's house to the house of the broker and weighing takes place. The potatoes are weighed in lots against a 28 viss weight and to this is added a further  $\frac{1}{2}$  viss or so as *swega* (weighing charges) to be taken from the buyer. Before weighing the produce in the basket, a double handful of potatoes is taken by the broker as *swega* from the seller. (See plate facing page 118). The bags, after the transaction is completed, may remain in the broker's godown for two or three days before being taken over by the purchaser. The latter then gets the produce sorted, weighed and stitched in gunny bags and finally sends it in carts to the railway station for consignment to Rangoon and other places.

#### (6) PRODUCERS' CO-OPERATIVE SOCIETIES.

The sale of potatoes through co-operative sale societies has not become popular. There are only three co-operative sale societies, namely, the Nilgiri Co-operative Sale Society in Madras, the Belgaum Co-operative Sale Society in Bombay and the Malir Co-operative Sale Society in Sind. The last named has ceased functioning for lack of interest by the office bearers. The Nilgiri Society is taking an active part in the sale of the produce of members. There are a number of co-operative credit societies (for details see Chapter on "Trade associations") which are affiliated to this Sale Society. The members of these societies send their produce to the commission shop of the central society at Mettupalaiyam. Here the produce is sorted out into different grades (details given in Chapter on "Grading") and the buyers are invited to buy. The cultivators seem to appreciate the system of disposal of their crop through the society. The total quantity assembled by this society in 1938 was 12,000 maunds.

#### C.—Markets.

In the ordinary language, a market may be taken to mean a place where a commodity is bought and sold. Any place or locality in which persons collect with the object of buying and selling any kind of article may be called a market. A market may be held in a place specially set up or built for the purpose, or on a piece of land in any convenient locality sanctioned by long usage. As a rule, markets in this country have not been established separately for each commodity. A number of allied commodities are usually sold in the same market. For example, potatoes are generally sold along with several other vegetables. Very often, the same merchant deals in all vegetables, but in most of the important wholesale markets such as Calcutta, Bombay, Karachi, Bangalore and Shillong, he deals only in potatoes and the closely allied commodities such as onion, ginger and garlic. Unlike fruits and vegetables, there are generally no regular wholesale markets for potatoes except in a few cases. However, the merchants and commission agents who deal in potatoes have usually their godowns and shops in the same street situated on one or both sides of it. Each of the commission agents keeps independent premises which usually consist of a hall open in the front and with a few godowns adjoining

to it. The hall is usually used for exhibiting the produce for sale and for transacting business. The surplus supplies are kept in the godowns. The main wholesale potato market in Bombay, a description of which is given later and which is situated in Duncan Road may be taken as a typical example.

Besides the markets in the big assembling and consuming centres, there are markets in villages. They are held periodically in the rural areas where several agricultural commodities, including potatoes, are brought for sale. The most common types of the periodical markets are the weekly bazárs known as *painths* and *hats* in the United Provinces, Bihar and Orissa; *hat* in Bengal, bazár in Assam and *shandi* in South India. They may be held once or more than once every week. The existence of such periodical markets is due to the special nature of the area in which the peasants may be cut off from the towns on account of defective communications or long distances. They are very common in Bengal, Assam, Orissa, Bihar, Eastern United Provinces and, to a certain extent, in the Madras and Bombay Presidencies. They are important assembling centres, particularly in Assam, where almost the entire produce of potatoes is assembled in such markets. They are usually held in the open. Sometimes small tin sheds are also provided for protection from rain and sun. In certain cases, small platforms are built on which the produce is exhibited for sale.

A brief description of some of the important assembling and consuming markets is given in the following pages.

#### (1) DESCRIPTION OF MARKETS.

*United Provinces.*—In the United Provinces, the principal assembling and distributing centres are Farrukhabad, Kaimganj, Karimganj, Jaunpore, Haldwani, Dehra Dun, Meerut, Lucknow and Cawnpore. In all these places, the commission agents' warehouses serve the purpose of a market, excepting in the case of consuming centres such as Lucknow and Cawnpore where potatoes are sold in the regular wholesale markets along with other vegetables and fruits.

*Delhi.*—Subzimandi is an important wholesale market for fruits and vegetables in Delhi. The market area is the property of the Government and is controlled by the Nazool Department\*. The shops are auctioned individually once in three years and the rents are collected quarterly from the highest bidder in advance. Four stone-paved platforms about 1½ ft. high, separated by two foot paths running at right angles to each other in the middle, are provided for the auction of fruits and vegetables. The godowns and shops are not built to any specific pattern. Sanitation is poor and proper arrangements for drainage are also wanting. Facilities for washing fruits and vegetables, parking ground for carts, flush latrines, etc., are entirely wanting. It is, however, understood that the Delhi Improvement Trust has sanctioned a scheme for building an up-to-date market at a suitable site not very far from the present market.

*Bihar.*—There are no markets in which the wholesale dealings of potatoes are the only business transacted. Individual dealers, in most of the towns in the province, have their own godowns for the transaction of business. The important assembling markets in Bihar are Patna and Bihar Sharif.

The market at Patna may be regarded as a wholesale market for potatoes. It is also known as Masalapur *hat*. There are tin or tile sheds on three sides for storing different commodities and an open space in the centre. It is owned

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\*A department dealing with government lands.



TAKING A DOUBLE HANDFUL OF POTATOES AS SWEGA.



WHOLESALE MARKET, MANCHAR.



A POTATO HEAP BEING INSPECTED BY THE BUYERS BEFORE AUCTION.

by a *panch* i.e., a society of businessmen, who purchased the land and built the market as it stands today. The premises occupied by the *arhatiyas* are rented. There are five commission agents engaged in the potato business in this market. They help the growers in selling and storing the produce at their godowns. They put the buyers in touch with the sellers. The prices are settled by bargaining between the parties concerned. If the buyers and the sellers do not agree, the *gaddidar* or commission agent intervenes and settles a price acceptable to both. He charges a commission of 6 pies per rupee and a *kharcha* (miscellaneous charges) of two annas per maund from the seller. In addition to this, the commission agents have been known to make big profits by charging from the sellers or buyers or from both a charge locally known as *gauli*. He promises to secure the most favourable terms to the buyers or the seller or both. He is usually clever enough to make the transaction appear favourable to each party. *Gauli* is paid to him as a sort of reward for the useful services rendered and may sometimes amount to as much as Rs. 1-8-0 per maund.

*Bengal.*—In Bengal, potatoes are assembled in *hats* and assembling markets in some of the towns. The important ones are Mamari, Kalna, Tarakeshwar, Sheorafulli, Vishnupur, Joypurhat, Mirkadam, Lalmonirhat and Ganj.

In most cases, the markets belong to the local zamindars or land owners. In some of the places, periodical *hats* are held where potatoes are brought by the growers for sale.

The most important market in the province is in Calcutta and is known as Aluposta. It is the biggest wholesale market in the province and is situated near the Jagan Nath Street. It belongs to a local zamindar and has been leased out to a private person for about 10 years. The monthly lease has been fixed at Rs. 2,200. The lessee has to pay in addition a sum of Rs. 200 to the corporation as tax, which includes Rs. 100 on account of the market licence fee.

The land belongs to the zamindar, and the shops and godowns have been erected by the commission agents working therein. In all, there are about 102 godowns. The shops are arranged in 2 rows with a passage of about 12 ft. in between. The wholesale transactions are conducted in the open verandahs in front of the godowns. The sizes of the godowns and shops vary from 16' × 20' to 16' × 24' and their rents from Rs. 40 to Rs. 80 per month according to the size and location. The rents have been fixed once for all and do not vary from year to year unless the municipality increases or decreases the house tax.

The potatoes are sold by private negotiation or by open auction. The rates for Burma potatoes are, however, settled mutually by the commission agents and the representatives of the Burmese exporters. This is done after the consignment has reached the market. While fixing the rates, the purchase price in Rangoon, the cost of transport and the conditions of local supply and demand are taken into consideration. A general rate is fixed for potatoes of average quality. The rates for individual consignments of superior or inferior quality are different. Once the rate is settled, the commission agent becomes responsible for selling the goods at his own risk. Generally he is put to no loss, as the price is fixed in the light of the local market conditions of which he is fully aware. The practice of settling the price in consultation with the representatives of the exporters is possible because during this season the exports from Burma constitute the principal supply in the market. The Burmese exporters are thus in a strong position and, as they usually act collectively, have an effective say in the settlement of the price.



*Assam.*—In Assam, there are no regular markets. The potatoes are assembled in the periodical bazárs commonly held in the producing areas. The most important bazárs are Happy Valley, Dorigodown, Jhalupara and Manplang. The village merchants and wholesalers, who buy potatoes in the bazárs, have erected small godowns in their vicinity for storing the produce. When sufficiently large quantities are collected, they are transported to Shillong for sale to exporters who have their godowns in Paltan bazár. The prices are fixed by private negotiation. No market charges in the form of commission, etc., are charged.

*Bombay.*—In the Bombay Presidency, there are several assembling markets ; the most important ones being at Poona, Ahmedabad, Dharwar, Manchar and Boriavi. In most cases, there are no regular market places and the business is transacted by individual wholesale merchants and commission agents in their own shops. In some places, such as Poona, Ahmedabad and Kolhapur, the potatoes are sold in the general fruit and vegetable markets. Recently, an up-to-date potato market at Manchar, one of the important assembling centres, has been built by a local *zamindar*. It is known as Akbar Market and was first built in 1932. (See plate facing page 118). Its total area is about 4 acres. There are two big sheds,  $140' \times 40'$  and  $150' \times 30'$ , and a small platform. The space in the sheds is divided into 95 small stalls marked out by lines, each stall being  $8' \times 8'$ . There is a well in the centre of the market and also a small dispensary. The cultivators who bring the produce to the market get their evening meals free of charge. The produce is arranged in heaps in the spaces marked. A clerk then goes round and writes down the name of the owner, and the estimated quantity of each heap in terms of bags on a piece of paper and puts it on the heap for the information of the buyers. The auction starts at about 3 o'clock when the heaps are ready. The purchasers assemble around each heap in turn, examine the produce, sometimes by thrusting their hands deep into the heap, and, after satisfying themselves about the quality, offer bids. (See plate facing page 119). The name of the highest bidder and his bid are noted by the clerk. One heap is usually auctioned in about two to three minutes. After the close of the auction, the proprietor of the market pays the price to the sellers and realizes it from the buyers within three days or so. The proprietor has usually to keep a fluid capital of about Rs. 25,000. He charges a commission of eight annas per bag of 200 lb. from the sellers. Proper sale accounts giving particulars of the quantity sold, price, commission, etc., are supplied to the seller on a printed form [see Appendices XXIV and XXIV(a)]. The proprietor of the market also supplies potatoes on order to outside purchasers on a commission basis. He buys the produce for executing such orders in the open auction and debits the same rate to the person on whose behalf he buys, charging a commission of four annas per bag for this service. He does not purchase the produce on his own account. This seems to be the only instance in the whole of India where a commission agent of substantial means does not buy for himself the produce brought to him for sale. As will be shown later, the practice of buying potatoes by the commission agents themselves is open to serious objections.

In Bombay proper, there are about a dozen important firms engaged in wholesale business in potatoes. Their shops and godowns are situated in Duncan Road. The wholesale buyers have to go to these shops for making the necessary purchases. Generally, a firm has a big hall open in front and having one or two godowns attached to it. The potatoes are exhibited for sale in the hall,

where the transactions also take place. The commission agents themselves, hawkers, stall holders and provision contractors are the usual purchasers. Approximately, about 40 per cent of the produce is bought by hawkers, 50 per cent by stall holders and provision contractors and 10 per cent is re-exported to other towns by the commission agents themselves. Before settling the bargains, the purchasers usually inspect the produce from a few bags selected at random.

Another important market for potatoes in the Bombay Presidency is the Reay Market at Poona where all kinds of fruits and vegetables are sold. In this market a big shed has been built where only potatoes are sold. It consists of ten compartments which are let out to five commission agents. The rent of a compartment varies from Rs. 12-8-0 to Rs. 13-12-0 per mensem. The carts are parked in the open space provided for this purpose on all sides of the shed. The potato bags are unloaded in the compartment of the commission agent through whom they are to be sold. (See plate facing page 122). The commission agents, the potato stall holders of Reay Market, other wholesale dealers and the military contractors are the chief buyers. The sales begin in the early hours of the morning and last till about 1 P.M.

The commission agents show the samples to the purchasers and settle prices for each lot by calling bids under cover. Although the place where sales are conducted belongs to the municipality, the latter exercises no control over the marketing practices. About 60 per cent of the total produce is bought by the five commission agents referred to above, 10 per cent by the military contractors and 30 per cent by the local retailers. The commission agents despatch the potatoes that they buy, to the outside markets.

*Madras.*—Mettupalaiyam is the largest assembling market for potatoes in the Madras Presidency. About 4 lakh bags of 200 lb. each are handled annually in this market. The produce is brought to the commission agents who are about 40 in number. They have their own premises consisting of an office room with two or three godowns and one or two sheds which are open on one or two sides. There is also a small open space in front of the shed for drying the produce, if necessary, before putting it into the godowns. The business is transacted in the sheds. The commission agents store the produce and distribute it to the consuming areas in and outside the presidency. The bulk of the produce brought for sale is purchased by the commission agents themselves for re-sale, on their own account, in the consuming markets.

Next to Mettupalaiyam is the Madras market, which is only a consuming market. It consists of godowns situated at Kothwal bazar. These godowns belong to individual merchants. Some of the Mettupalaiyam commission agents have also opened their branches here. Besides the regular commission agents, there are some people who do not own godowns but who order wagon loads of potatoes for direct sale to retail merchants at the Kothwal bazar, which is the largest retail market for potatoes in the presidency.

*Punjab.*—The important assembling and distributing markets in the province are Lahore, Jullundur, Ambala, Karnal, Sialkot, Simla and Kalka. Lahore, Rawalpindi, Amritsar, Ludhiana, Sialkot and Lyallpur are the only towns in the province where there are separate markets for sale of fruits and vegetables (including potatoes). In other towns, fruits and vegetables are sold in one and the same market. In a few places, *e.g.*, Simla, Karnal, Gujrat and Lalamusa, the wholesale transactions of potatoes are also made in the general grain markets. At places where no regular markets exist, the sales are made at the shops of individual merchants, as at Kalka, where the potatoes are handled by the grain dealers.

The most important market from the point of view of wholesale distribution of potatoes is at Lahore. It is privately owned and the commission agents have to pay jointly a rent of Rs. 3,900 per annum. The individual commission agents pay from Rs. 4 to Rs. 30 per month. The market is located in the heart of the city near the retailing centre and is accessible by good roads. It is rectangular in shape and has an area of about two or three acres. As regards accommodation and shelter, the market presents a sad look. The covered area hardly constitutes 2/5ths of the whole and there are no godowns. Some of the important commission agents, however, have erected temporary sheds at their own cost. There are six stalls which are occupied by three commission agents. A cart path running centrally divides the market into two parts, each of which is further sub-divided into two plots where the individual commission agents hold auctions. There is no provision for sanitation and other facilities. For want of space, some of the agents have hired private buildings for their office work in the vicinity of the market. Six out of 32 commission agents transacting business in this market are important. They deal in the locally produced as well as the imported vegetables including potatoes. The remaining agents deal in the local produce only.

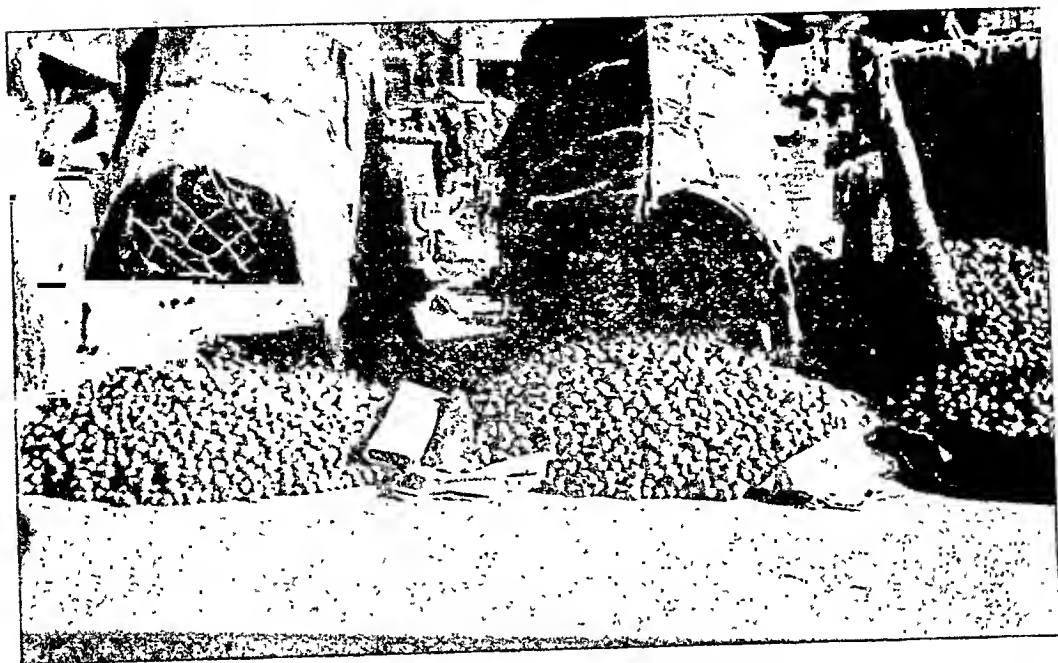
The markets at Lahore, Rawalpindi, Amritsar and Ludhiana are privately owned. Their management is entirely in the hands of the commission agents who look after the general cleanliness of the market. The local bodies do not provide any facilities, nor do they exercise any control over the markets.

*Sind.*—The important wholesale markets are located at Karachi, Hyderabad, Sukkur, Shikarpur, Jacobabad and Larkana. Excepting Karachi and Hyderabad where the wholesale transactions take place at the merchants' godowns, potatoes are sold in the market compounds where other vegetables and fruits are also dealt with by the same merchants. The markets are owned by the municipalities, which look after sanitation and other arrangements. All unwholesome and damaged potatoes are destroyed by the sanitary inspectors or other competent staff.

Karachi is the most important market for potatoes in the whole of the province. Here the different commission agents have their own godowns and shops where the wholesale business is transacted. The produce may be sold in bags as received from producing areas or the bags may be emptied and a big heap made in the open. Prices are then settled by private negotiations and the produce is weighed.

*Mysore.*—The important assembling and distributing markets for potatoes are Bangalore, Chikballapur, Maher, Bowringpet and White Field. Bangalore is the most important of all. There is no regular market place in Bangalore but all the commission agents have their separate godowns in one locality. There are small open spaces in front of the shops for the exhibition of the produce for sale. In most cases, there are also large godowns open on one side where business is usually transacted.

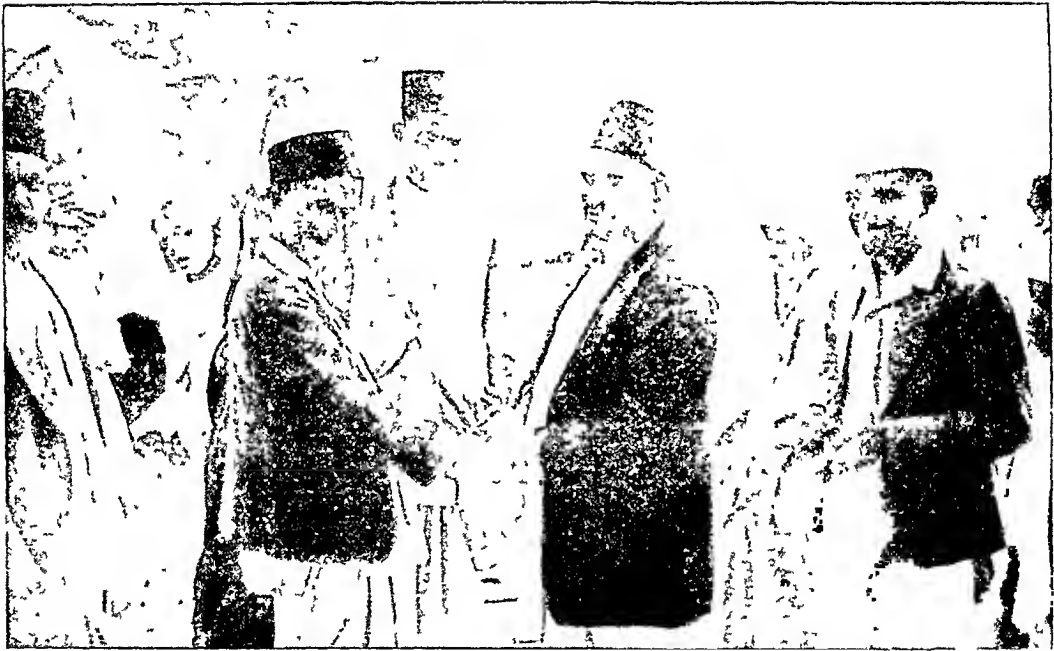
*Burma.*—In Burma, the principal assembling centres for potatoes are Aungban, Heho, Nawngkhio and Myitkyina, of which Aungban and Heho are the most important. There are no regular markets for potatoes throughout Burma and the warehouses of the merchants dealing in potatoes are usually the places where the produce changes hands. Wholesale transactions also take place in the periodical bazárs which are held in all the producing centres. The produce ultimately comes to the premises of the potato traders before it is sent out to other markets.



POTATO CARTS BEING EMPTIED IN THE MARKET AT POONA BEFORE SALE.



POTATOES UNLOADED FOR SALE IN THE MARKET.



OFFERING A BID UNDER COVER.

## (2) OWNERSHIP AND CONTROL.

From the above discussion it is obvious that, except in a few cases, there are no regular market places for potatoes. Calcutta, Lahore, Rawalpindi, Amritsar, Poona and Lucknow have regular markets, but in most of them other vegetables are also sold. The markets are privately owned and so there is no organisation and control. As pointed out earlier, warehouses of the commission agents serve as a market place and so the producers who take their produce, do not generally get the real benefit arising out of competition amongst buyers in the open markets. As the buyers are scattered all over the warehouses of different commission agents, the element of competition is absent. The producer seldom knows the rates at which potatoes are being sold in the godowns of other commission agents. He has to accept whatever price is offered to him by the commission agent or an occasional buyer, who may visit the godown of the commission agent, for it is inconvenient to take the produce back to the village. In the present conditions growers who really desire to sell in the markets are few, because there are no regular open markets. Moreover, sales in markets are in many cases followed by disputes arising out of the methods of weighing and the quality of the produce.

Under these circumstances, the cultivators are never too anxious to take their produce to the market, if they could help it. In their own villages they are in a little better bargaining position in this respect, for they can refuse to sell if the price offered is not favourable. But if there are no buyers in the villages, they have no option but to take it to the market for sale.

## (3) REGULATED MARKETS.

From the description of the wholesale markets, it is seen that the municipalities or other local bodies under whose jurisdiction they are situated have no control over their business methods. The marketing charges and allowances are numerous and complicated and it is but natural that the producer prefers to sell his crop in his own village. In order to encourage the sale of potatoes in markets, it seems desirable that the market practices should be standardised and the market charges fixed.

Certain provinces and States such as Bombay, the Central Provinces, Madras, Hyderabad and Gwalior have regulated markets in which charges are clearly specified and the usage of trade is governed by definite rules and regulations established under the Market Acts. But hitherto the rules have been applied mainly to cotton. The experience in cotton marketing in the regulated markets has shown the possibility of usefully extending the Act to other commodities. It is highly desirable to apply the Acts to the potato markets wherever they exist, particularly in the provinces where potato is an important crop. Market Acts are under the consideration of several local Governments and it is hoped that before long they will be enforced in almost all the provinces and States.

In the absence of a Market Act, a system of registration of markets could be introduced. The market charges should be fixed. The commission agents doing business in such markets should be required to take out a licence and to deposit a security which could be utilised towards the payment of dues from consignments sold in case of default. In quite a large number of cases it has been noticed that the commission agents do not pay the sale proceeds, particularly to consignors who are at long distances or who send their produce occasionally

to the market. The latter do not find it convenient to sue the commission man. They simply forego the amount and do not send their produce to the market again.

The establishment of regulated markets appears to be the only remedy for putting an end to undesirable practices in marketing. The producer and the purchaser will get fair terms and the intermediaries a reasonable reward for the services rendered by them.

The introduction of regulated markets of potatoes at important assembling and distributing centres will lead to a uniformly organised and profitable trade. Standard weights will eliminate the possibility of the cultivator being deceived in the process of weighing. This will encourage him to bring his produce to the market himself. Licensing of all the persons operating in the market and fixation of market charges will decrease the costs of distribution to a considerable extent. Very often, growers are afraid of disputes, but in the case of regulated markets they would receive full justice as they would be represented on the market committees. There is an obvious need for the erection of more potato markets provided with adequate cover and conveniences such as feeding and sanitary accommodation. In view of the fact that the erection of such markets has been found a profitable private enterprise, local authorities might well consider the undertaking of a public utility service of this nature. The control of market conditions would at the same time be simplified if the markets were publicly owned.

#### (4) MARKET PRACTICES.

(a) *Procedure of sale.*—The produce, as pointed out earlier, is either sold in the villages on the producers' holdings or in the markets. The procedure of sale in these two cases is different.

(i) *Sales in villages.*—The buyers visit the villages and approach the cultivators either directly or through a village merchant. If the purchaser is a person who has been doing business in the village for a long time and is well known to the villagers, he makes a direct approach. But if he is a stranger, as is very often the case, he seeks the help of the village merchant and approaches the cultivator through him. The village merchant is usually helpful to the purchaser as he provides him with lodging and board, if necessary. He generally pretends to be more sympathetic towards the seller than the purchaser. He acts as a broker and helps the buyer and the seller in settling the price. The buyer inspects the quality of the produce and makes an offer which is usually lower than what he is ultimately prepared to pay. Higgling is a common feature. The broker tries to raise the price. Once the cultivator finds that the broker is taking his side, he leaves the whole thing to the broker's discretion who, after a certain amount of higgling, succeeds in settling the price to the satisfaction of the cultivator. If the rate is settled on a weight basis, the village merchant also weighs the produce and charges a commission for his services varying from two to eight annas per bag of about 2½ maunds.

In the villages, chiefly in Bombay and Madras Presidencies, the produce is not weighed, but the rates are fixed on a bag basis irrespective of the quantity put in. The condition is a full bag, but it is understood that expert coolies can fill in about 10 to 12 per cent more than the ordinary capacity of the bag. In the Punjab, the United Provinces, Bengal and Bihar, the common practice in the villages is to weigh the produce, the rate being fixed on a maund basis.



(ii) *Sales in markets.*—As regards the procedure of sale in the markets, it has been found that the local customs do not differ greatly in principles from one province or State to another, but there are considerable variations in details. As in the case of other vegetables, the sale of potatoes starts very early in the morning. On arrival, the produce is taken to the shop of one of the commission agents in the market. The agent selected is generally one with whom the grower, the village merchant or the *beopari* had dealings previously. The produce may be heaped in front of the commission agent's shop or allowed to remain as it is brought in bags or in carts. (See plate facing page 122). Sometimes, the produce is unloaded and a preliminary sorting of the diseased and damaged tubers is made or, as in Mettupalaiyam, it is sorted out into three or four sizes (for details see Chapter on "Standardisation"). In certain places, e.g., Poona and Bangalore, the sorting of the damaged and diseased potatoes is done after the rate is settled. The common practice of sale in most markets is that the produce is first sorted out and then the bids are called. The buyers inspect the quality of the produce before making their offers.

The rates are fixed on a lot, bag or weight basis. The system of sale by weight is more common but it is not uncommon to have all the three systems of sale operating in the same market.

(b) *Methods of sale.*—The prices are settled by the commission agents on behalf of the seller with the buyer (i) by private negotiations, (ii) by open auction, or (iii) under cover. The system of sale, however, may vary from time to time in the same market. In Bangalore market, for example, sales take place by open auction when the number of buyers is large and by private negotiations when the number is small. The price is generally communicated to the seller before the close of the bargain, if he happens to be there, and he has usually the option to accept or reject it. In very rare cases do the cultivators keep the produce for sale till the next day, because it is inconvenient to make the necessary arrangements for storing the produce and feeding and accommodating the draught animals for the night. In the case of goods received from distant markets for sale, the commission agents have the authority to sell them at whatever rate they like. They remit the sale proceeds to the owner after deducting their charges.

(i) *Private negotiations.*—The purchasers make their offers personally to the commission agents. The bargain is struck after a certain amount of higgling. This system is common all over the country.

(ii) *Open auction.*—The buyers assemble at a fixed time in the market or in the shops of the individual commission agents. Each lot is put to auction separately by the auctioneer, who is usually the commission agent himself. The highest bid is accepted, subject of course to the seller's approval. This system is in vogue in many markets such as Simla, Lahore, Manchar, etc.

(iii) *Under cover.*—According to this system, the buyer conveys the rate to the commission agent by clasping the latter's hand under a piece of cloth and pressing the fingers indicates the rate at which he is prepared to buy. (See plate facing page 123). The commission agent, before deciding the rate, calls for bids from other buyers who may be present and finally disposes of the produce to the highest bidder. This system of sale is found in Bombay and Sind and also to a certain extent in the Punjab.



(iv) *Comparison of different methods of sale.*—The sale by private negotiations is a slow process and takes a good deal of time. It is, therefore, generally not followed when large quantities have to be disposed of or when the number of buyers is large. The system of settling the price under cover is looked upon with great suspicion by the sellers, but the commission agents who have adopted this system claim that they usually succeed in getting better prices for the produce as the buyers, not knowing what the others are bidding, are likely to offer the maximum price that they are prepared to pay. In the open auction system, this extreme limit may not be reached in each case, for it is possible that a purchaser may get the produce at a price lower than what he would have been prepared to pay otherwise. Against this may be mentioned the tendency amongst buyers to overbid one another in open auction and thus raise prices. The bids under cover offer great scope for malpractices, usually to the disadvantage of the seller, as the commission agents may not pay the seller the actual amount for which the produce is sold. There should, however, be no serious objection to this system if the final bid is openly declared.

#### D.—Market charges.

Potatoes, as a rule, pass through several hands before they finally reach the consumer and various expenses are incurred at different stages. This section of the report deals with the charges incurred from the time the potatoes pass into the municipal limits of a city till they reach the buyer's godown in the market. The charges reduced to a uniform basis, *i.e.*, per maund, for some of the important markets in each of the major provinces and States are shown in Appendix XXIII. It will be seen therefrom that the charges differ widely from market to market. In some cases, they are payable by the sellers while in others by the buyers, and still in others by both the buyers and sellers. In most markets, however, they are borne by the sellers. In every market, there is a number of charges but no uniformity about their payment. A charge payable by the seller in one market may be payable by the buyer in the other with the result that the proportion payable by buyers and sellers differs widely in different markets.

In certain markets, the charges vary with the source of the produce. In Calcutta, for instance, the total charges on potatoes imported from Burma, United Provinces, Bihar and on the local produce amount to Re. 0-2-4, Re. 0-4-9, Re. 0-4-9 and Re. 0-2-4 per maund respectively. In some places in the Punjab also, the market charges vary according to whether the potatoes are imported or locally produced. Again, charges on the produce for local consumption are different from those on the produce intended for despatch to the other markets. For instance, the total charges in the case of potatoes intended for local consumption vary from 1 anna 3 pies to 6 annas 8 pies per maund in different markets. In the case of potatoes which have been imported or are to be exported, they vary from Re. 0-2-0 to Re. 0-4-11 and Re. 0-3-0 to Re. 0-5-3 per maund respectively.

The commission agents also meet some of the charges, such as terminal tax, haulage from railway station to the market and the cost of sorting, weighing, etc., all of which are recovered along with their own commission from the buyers or sellers according to the local custom.

The deductions made from the buyers and sellers may be in cash or kind or both, and are known by a variety of names in different markets. Generally speaking, they fall under the following heads:—

1. Commission.
2. Market fee.
3. Handling charges.
4. Charity.
5. Haulage.
6. *Bilti* expenses (rail *kharcha*).
7. Octroi and terminal tax.
8. Miscellaneous.

### (1) COMMISSION.

It is the remuneration paid to the commission agent for the services rendered by him in conducting sales. In certain markets, *e.g.*, Lahore and Amritsar, the commission is charged from the seller only and in others, *e.g.*, Simla, Kalka and Rawalpindi both from the buyer and the seller. In Masalapur *hat* at Patna, it is charged from the seller who, in accordance with an established practice, realises it from the buyer. In some markets, such as Shillong, there are no sales on a commission basis except in the case of the produce supplied to orders of merchants in distant markets when the wholesalers act as commission agents.

The commission may be charged on the basis of a bag as in Mettupalaiyam and Bombay, a maund as in Calcutta and Lahore or value as in Patna, Hyderabad (Deccan) and Simla markets. There is a great variation in the amount of commission charged at different places. It may be as low as 5½ pies per maund as in Simla or as high as 4 annas per maund as in Karachi.

### (2) MARKET FEE.

Sometimes, the municipalities or the owners of the private markets or the commission agents working therein levy a toll on potatoes entering the market as at Lahore, Karachi, Hyderabad (Sind), etc. The market fee may be charged on a maund or load basis. The basis of the charge, in some of the markets, is shown in the following table:—

Name of the market.	Basis of charge.	Amount charged.	
		A.	P.
Lahore . . . . .	Per cart-load . . . . .	0	6
Lahore . . . . .	Per tonga-load . . . . .	0	3
Lahore . . . . .	Per lorry-load . . . . .	1	0
Lahore . . . . .	Per bicycle-load . . . . .	0	6
Karachi. . . . .	Per bag . . . . .	0	3
Hyderabad (Sind) . . . . .	Per cart-load . . . . .	2	0
Sukkur . . . . .	Per cart-load . . . . .	4	0
Jacobabad . . . . .	Per 12 maunds . . . . .	1	0
Hyderabad (Deccan) . . . . .	Per bag . . . . .	4	0
Hyderabad (Deccan) . . . . .	Per basket . . . . .	2	0
Baroda . . . . .	Per cart-load . . . . .	1	6

It will be seen that the weights of the loads are not defined in all cases. Variations in the different markets are considerable. In quite a large number of markets, however, no market fee is charged.

### (3) HANDLING CHARGES.

The charges made under this head comprise the wages paid to the labourers for unloading the produce in the market, dressing it for sale and weighing, filling and sewing the bags. They are payable by the seller and are generally charged on the basis of a bag in the case of imported or exported produce as in Bombay, Calcutta and Karachi and on the basis of a cart-load in the case of local produce as in Poona and Ludhiana. The rate of charge made on this account varies from  $\frac{1}{4}$  to 1 anna per bag in different markets.

### (4) CHARITY.

The amount collected under this head is supposed to be distributed as charity amongst orphanages, schools, temples, mosques or other charitable institutions. It is evident that many of the objects for which charity is collected have no direct connection with the marketing of potatoes. The worst feature, however, seems to be that these collections are not always utilised for their legitimate objects but are sometimes retained by the commission agents themselves. Charges on account of charity are made both from sellers and buyers in some markets as Simla and Haldwani, from sellers only as in Calcutta and Bombay and from buyers only as in Shillong and Patiala. The practice of getting this charge from sellers alone is common in most markets. The amount charged is usually three pies per maund. It, however, varies from half a pie per maund in Multan to five pies per maund in Calcutta and Surat. In some markets, such as Bangalore, no charge is made on this account.

### (5) HAULAGE.

In the case of potatoes imported or exported, the commission agents charge from the sellers or the buyers, as the case may be, a certain amount for the cartage of the produce from the market to the railway station and vice versa. The charges are realised from the seller in the case of imports and from the buyer in the case of exports. In most markets, this charge is made on the basis of a bag. Sometimes, however, as in Gujranwala in the Punjab, it is based on the weight of the produce. The charges vary in different markets, mainly according to the distance of the market from the railway station. The commission agents in different markets realise a fixed amount, irrespective of what they actually spend in carting. It is observed that the charge made is usually more than the actual expenditure.

### (6) BILTI EXPENSES (RAIL KHARCHA).

This is a sort of gratuity paid by the merchants to the subordinate railway staff at the time of booking or taking delivery of the goods. Although the payment is entirely voluntary, it has become more or less an established practice and has acquired the permanence of a customary charge. The charge is made on the basis of a load in the case of small consignments and on the basis of a wagon in the case of bulk transport. In the Punjab, the charges at booking

stations vary from three pies to one anna and at receiving stations from three pies to nine pies per bag of two maunds. In the case of wagon loads, the charges vary from Rs. 2 per wagon at Ambala, Gujranwala and Jhelum stations to Rs. 3-8-0 per wagon at Montgomery. At certain stations, such as Kalka, the charge varies from Rs. 2-12-0 to Rs. 5-12-0 according to the size of the wagon. By such payments to the railway staff the dealers wish to obtain additional facilities in booking and taking delivery to suit their own particular convenience. At most stations, the working hours for the booking and delivery are fixed, but wherever the system of giving gratuity is prevalent, goods can be booked or received at all times. Since the railway employees work at odd hours for the convenience of the dealers, they are given small sums as a remuneration for their services. Railway Administrations, of course, discourage this irregular practice and cases in which the staff are found to accept such payments are severely dealt with.

#### (7) OCTROI AND TERMINAL TAX.

These are the charges made by the local bodies on the produce entering the municipal limits and the payment is made invariably by the sellers. When the charge is made on an *ad valorem* basis, the tax is called octroi and when it is made on weight basis it is known as a terminal tax. These charges are common in the Punjab and the United Provinces. There are, however, some markets, such as Simla, Kalka, Campbellpur, Gujranwala, etc., where octroi or terminal tax is not levied on potatoes. The terminal tax may be as high as Re. 0-1-9 per maund at Lahore or as low as three pies per maund at Rawalpindi. In Bengal, Bihar, Orissa and Assam, there are no octroi or terminal taxes on potatoes.

#### (8) MISCELLANEOUS CHARGES.

These include postage and telegram charges, *karta* or *karda*, *miti* and *adpawmani*, *dami*, etc.

*Karda* is an excess allowance given to the buyer in lieu of the dirt and other extraneous matter among the tubers and for the loss in weight on account of shrinkage during transit. This charge is made in certain markets such as Patna, Lahore, Amritsar, Rawalpindi, Ludhiana, etc. Usually, the benefit of this goes to the buyer, but, in some markets such as Ludhiana and Jullundur, it is retained by the commission agent who buys the produce on behalf of his clients in outside markets. The amount of *karda* allowed varies from market to market. It is 5 seers per bag of 2 maunds, i.e., 6-25 per cent in Lahore, Sialkot and Amritsar, half a seer in Ludhiana and  $1\frac{1}{2}$  to  $2\frac{1}{2}$  seers in Rawalpindi. In addition to a deduction on account of *karda* in kind, in certain markets, the buyers get a small rebate in cash as well. For example, in Ludhiana, Jullundur and Sialkot markets a rebate of Re. 0-12-6, Re. 0-10-0 and Re. 0-9-0 per cent respectively is allowed to the buyers on the value of the produce.

*Miti* and *adpawmani* represent a sort of interest charged from the seller by the commission agent for cash payment made to him for his produce. The buyers as a rule pay the price after a few days. As the producers cannot wait, the commission agent pays the sellers from his own pocket. For this, he makes a small charge from the seller which varies from market to market. The *miti* and *adpawmani* at Rawalpindi market are 5 annas per cent.

*Dami* is another form of commission which the agent charges from the buyer. At Simla, *dami* is charged at about 8 pies per maund.

If the sellers and buyers do not visit the market, a certain amount of correspondence takes place with the commission agent for arranging sales and purchases, and the actual cost incurred on postage, papers, etc., is charged from the buyer or the seller, as the case may be.

From the above it is evident that the marketing charges under different heads vary considerably from place to place. The range of the various charges (based on Appendix XXIII) in the different markets of India is given below :—

*Range of market charges made under different heads.*

(Per maund.)			A. P.		A. P.
Commission, ranging from . . .			0 $\frac{1}{2}$	to	4 0
Brokerage, ranging from . . .			0 $\frac{1}{8}$	to	1 0
Haulage, ranging from . . .			0 $2\frac{1}{2}$	to	1 9
Charity, ranging from . . .			0 $\frac{1}{8}$	to	0 5
Handling, ranging from . . .			0 $1\frac{1}{2}$	to	1 9
Octroi, ranging from . . .			0 3	to	1 9
Miscellaneous, ranging from . . .			0 $\frac{1}{2}$	to	4 3

As a result of wide variation in the charges in different heads the total marketing charges are also different at different places. The charges at some markets are certainly excessive. They have to be met because they are sanctioned by long usage and because the people affected by them, viz., the producers, have no organisations to safeguard their interests and to keep them within reasonable limits. It is desirable that the market charges should be regulated in order to bring them more or less to a uniform level after making due allowances for local peculiarities.

## INTER-CHAPTER SIX.

In India, the more important potato producing centres lie far away from the consuming markets. It is not, therefore, generally convenient or possible for cultivators to meet and arrange direct sales. This being the case, there have arisen two principal classes of wholesalers in the potato trade who act as the connecting link between the producing and the larger consuming areas. One set of wholesalers consists of those merchants who operate in the producing areas and are primarily engaged in buying potatoes from growers and arranging to despatch them to the consuming centres. The other class of wholesalers consists of those merchants who operate in the large consuming centres and are concerned with distribution to retail traders. Although growers generally want to market the produce themselves, in actual practice, the opportunity for doing so does not always occur. Often, as in Upper Assam districts and the Patiala State, they may have to sell the crop long before it is ready for harvesting. In such cases, buyers attend to the harvesting operation. The practice of receiving advances, either in cash or in the form of seed is common in all the potato producing areas, particularly in Bengal, Bombay, Madras, the Punjab, Sind and Mysore. When a commission agent advances a loan, he usually takes the potatoes to his own godown and arranges for the sale. If there are no buyers, the commission agent buys the produce himself. In the United Provinces, Bihar, Punjab and Sind, cultivators in the plains usually take the produce to the assembling markets and sell it through the commission agents. In certain cases, however, the produce is sold on the farm to village merchants or itinerant traders. In Assam, some weekly *hats* are held in the different parts of the producing areas where the local merchants buy the produce direct from sellers and later take it for sale to the exporters' godowns at Shillong. In Bombay Presidency, the extent to which the produce is sold through different agents varies from one centre of production to another. In the Poona district, about 45 per cent is sold in the local wholesale market, 50 per cent in villages, and 5 per cent in local bazárs. In Nasik and Ahmednagar districts, however, two-thirds of the produce is sold in local weekly bazárs and only one-third to merchants in villages. In the Madras Presidency, 80 to 95 per cent of the produce is assembled by the producers at the Mettupalaiyam market, and the remainder in different centres in the hills from

where it is distributed by local wholesalers to various markets. There is an increasing tendency amongst growers to sell the produce in the villages as this saves them the trouble of having to go to Mettupalaiyam. If the prices in the consuming markets are high, a large number of buyers themselves go to the villages and buy the produce direct from the producers. They, however, do not do so when the market is dull, and in that case growers have to take it to Mettupalaiyam.

In some parts of the country the village merchant plays an important part in the assembling of the produce. He advances money to cultivators at the time of planting and advances them money for their daily needs as well. In some parts, such as the Poona district in Bombay Presidency, and Nilgiri Hills in Madras, village merchants do not buy the produce themselves, but act as brokers for visiting merchants. In the United Provinces, itinerant merchants operate mainly in the hills. While going about in the villages they buy potatoes direct from producers or village merchants and after they have collected a sufficiently large quantity they return to Haldwani or Nainital where they sell the same produce through commission agents. Then there are the manure merchants of the Nilgiri Hills in the Madras Presidency who take part in the assembling of potatoes. They take manure from the agents of artificial manure concerns at Ootacamund or Coonoor and advance it on credit to growers, realizing the price at harvest time after the produce has been sold. They charge Re. 1 to Rs. 1-8 per bag over and above the current price which is equivalent to 33 to 50 per cent interest per annum.

Finally, there are the commission agents who advance loans to cultivators either in cash or in kind, on the understanding that the produce will be sold through them. From time to time, they or their agents visit the producing areas and give further advances to cultivators so that the latter may arrange for the transport of the produce to their godowns. Sometimes wholesalers simply settle the price and give an earnest money of Re. 1 to Rs. 5 and take delivery after two or three days. If prices fall during this interval, they go back to the village and negotiate afresh with the cultivator, with a view to inducing him to reduce his price in the light of changed market conditions. They forego their earnest money if they fail to get a reduction, but even then this practice is far from satisfactory from the grower's point of view.

The sale of potatoes through co-operative sale societies has not become popular in India. There are only three

co-operative sale societies, namely, the Nilgiri Co-operative Sale Society in Madras, the Belgaum Co-operative Sale Society in Bombay, and the Malir Co-operative Sale Society in Sind. The last named has ceased functioning owing to lack of interest on the part of the office bearers. The Nilgiri Society, on the other hand, takes an active part in the sale of the produce of members. There is a number of co-operative credit societies affiliated to this sale society and members of these societies send their produce to the commission shop of the central society at Mettupalaiyam. There the produce is sorted out in different grades and buyers are invited to buy. Cultivators seem to appreciate the system of disposal of their crop through the society.

Potatoes are generally sold not as a separate commodity, but along with other vegetables. Very often, the same merchant deals in all vegetables, but in most of the important wholesale markets, *e.g.*, in Calcutta, Bombay, Karachi, Bangalore and Shillong, he deals in potatoes and in closely allied commodities like onion, ginger and garlic only. Unlike fruits and vegetables, there are generally, except in a few cases, no regular wholesale markets for potatoes. Merchants and commission agents, however, who deal in potatoes usually have their godowns and shops in the same street, situated on one or both sides of it.

Recently an up-to-date potato market has been built by a local zamindar at Manchar, one of the important assembling centres in the Bombay Presidency. It is known as Akbar Market and was first built in 1932. Its total area is about 4 acres. There are two big sheds,  $140' \times 40'$  and  $150' \times 30'$ , and a small platform. The space in the sheds is divided into 95 small stalls marked out by lines, each stall being  $8' \times 8'$ . The produce is arranged in heaps in the marked spaces and sold by auction. One heap is usually auctioned in about two to three minutes. After the auction is over, the proprietor of the market pays the price to sellers and later on realizes the money from the buyers within three days or so. The proprietor, who has to keep a fluid capital of about Rs. 25,000, charges a commission of eight annas per bag of 200 lb. from sellers. Proper sale accounts giving particulars of the quantity sold, price, commission, etc., are supplied to sellers on printed forms. The proprietor of the market also supplies potatoes on order to outside purchasers on a commission basis. He buys the produce for executing such orders in the open auction and debits the same rate to the person on whose behalf he buys, charging a commission of four annas per



bag for this service. He does not, however, purchase the produce on his own account.

In Burma, conditions are slightly worse than in India. Potato growers get loans of seed and money at the time of sowing. At harvest, they have to settle their accounts from the sale proceeds and traders take away the whole of the produce. Growers, therefore, take no part in assembling. Even those who are free from encumbrances sell their produce to visiting agents or town traders and not in the open market.

## CHAPTER VII.—STORAGE.

The problem of providing proper and adequate storage facilities is particularly important in the case of a commodity of a semi-perishable nature such as potatoes. The produce of this crop is seasonal while the demand is spread out over the whole year. Although the seasons of harvesting in the different parts of India overlap to some extent, there remain considerable gaps and it is, therefore, still necessary to store potatoes to meet the demand in the off-season.

The two main practical problems to be faced in regard to storage are the extent of the price premium and the method and place of storage. The price to be realized has an important bearing on storage. In order that growers or merchants may store a commodity it is necessary that the ultimate selling price should equal the selling price at the harvest time *plus* a premium to cover all losses in storage, the interest on capital employed and the cost of labour and material involved in storage.

The seasonal rise in prices is a well-known tendency in the case of potatoes. During February and March, in some markets, they sell at Rs. 1-8-0 to Rs. 2-8-0 per maund, but from July to November, prices go up and are nearly double of what they are in the previous period. The rise in the price of seed potatoes is even higher. At the time of harvest their prices range from Rs. 1-8-0 to Rs. 2-8-0 per maund but after about six months the prices go up, and in most of the markets, particularly in the United Provinces, Bengal, Bihar and the Punjab they range from Rs. 5 to Rs. 14 per maund. In spite of such high prices, however, those who store potatoes do not make much profit as more than 50 per cent of the quantities are usually lost during storage. If this loss could be reduced, producers would obtain seed at a cheaper rate, and so the cost of production would be reduced.

The case of Burma is slightly different. There the main crop is available from July to November, and about 49 per cent of the produce is exported to India. The prices of potatoes in India are usually high during this period but begin to fall from November onwards. In the case of Burma, therefore, it would not pay to store potatoes with a view to exporting them later on to India.

In spite of the great importance of the problem of storage in the case of potatoes, it is rather strange that proper attention has not been paid to improve the storage conditions. As will be seen later, very crude and primitive methods of storage are practised by the growers and merchants alike. The use of cold storage facilities is almost negligible.

### A.—Methods of storage.

Under the present methods of storage, potatoes are liable to considerable damage. The merchants and commission agents, therefore, do not generally store them for any length of time. In most of the important consuming markets like Bombay, Calcutta and Madras, merchants try to dispose of the potatoes immediately on arrival and seldom hold stocks even for a week, except in very rare cases when the market is dull. It is only in the producing areas that potatoes are stored mostly by the producers and to a very small extent by the local merchants. In some cases, however, when hard pressed for money, the growers may sell the whole of their produce soon after the

harvest. Cultivators, who can afford it, generally keep the table potatoes for a couple of months or so. The question of storage of seed potatoes is more important, as they are to be kept for a long period extending up to seven months.

In the plains, the produce of the winter crop is generally stored as it keeps better. The rainy season's crop raised in Bombay, Mysore and Burma does not keep well owing perhaps to high rainfall during its growing period. The produce of this crop is, therefore, sold immediately after harvest and sometimes it is carried straight from the field to the market.

The methods of storage practised in different parts of the country vary considerably and cannot be conveniently grouped under suitable heads. The position in each of the important provinces and States is, therefore, discussed separately below.

*Bihar.*—In this province, table potatoes are not usually stored for any length of time. If, however, they have to be kept for some time they are spread out in an ordinary dwelling room to a depth of 1 to 1½ ft. Sometimes they are kept in bags.

For seed purposes, however, potatoes are stored in large quantities for a period of five to six months in the hot and rainy weather, namely, from March to October. Previously, potatoes were stored in baskets which were kept on low bamboo *machans*, usually a foot and a half above the ground. They are now stored in sand where they keep better and are also protected to some extent from the potato moth (*Phthorimea operculella*), the pest which causes most damage during the storage period.

The godowns used for storage are built on a higher plinth and are usually surrounded by other buildings to keep them dry and cool. Before storing, the potatoes are kept in the open for sometime so that the surface moisture may dry up. During this period, sorting is carried out and diseased and damaged tubers are removed.

Potatoes are stored 9" to 12" deep between two layers of sand, each 1" thick. Care is taken to cover all tubers; otherwise, they are liable to be attacked by the potato moth.

A week after storing, the tubers are examined to see the temperature. If it is found that heat has developed, the potatoes are taken out and left in the open for a couple of days. After removing the damaged ones, they are again covered with sand. If, however, the temperature in the heap is normal, it is opened after about a fortnight for picking out the damaged tubers. In the monsoon season, however, the potatoes are taken out more frequently for sorting out bad ones and for breaking off the sprouts, if any. After the monsoon, the sound tubers are kept, till the time of sale, in baskets arranged on a *machan* (platform made of bamboo). While in baskets, the potatoes are examined now and then for picking out the bad tubers and breaking off the sprouts. Some people keep the potatoes in sand even during the monsoon period.

Great skill is required for storing potatoes. One must know when to open a heap, how long to keep the potatoes in the open, and how long to keep them in baskets. Only expert people can determine the exact time for each operation. The percentage of damage during storage by this method may, therefore, vary considerably from one individual to another in the same village.

*United Provinces.*—In the plains of the United Provinces, table potatoes are not stored for long. If, however, they have to be kept for some time they

are either heaped loose in a room, or kept in bags. For seed purposes, large quantities of potatoes are stored mainly in the districts of Farrukhabad, Jaunpore and Meerut. The method of storage is more or less the same as followed in Bihar, and the losses in storage are usually very high. In the hills potatoes for seed purposes are stored by burying them in pits dug out for the purpose. Most of the growers, however, keep them in ordinary rooms.

As the losses in storage are high, cultivators have shown a desire to have an improved method of storage. In order to reduce losses a cold store was opened in Meerut in 1938 in which seed potatoes are stored. This has been discussed later in the report.

*Bengal.*—Small quantities of both table and seed potatoes are stored by the well-to-do merchants who can afford to keep their stock for some time. Table potatoes are stored for a short time while seed potatoes are kept for about five to six months. Thatched houses are usually used for this purpose. Some producers store the produce in their houses having *kachcha* floors, on which sometimes a layer of dry sand is spread to keep the potatoes dry. Well-to-do producers, however, make bamboo *machans* in the thatched houses over which the potatoes are spread out. This method is considered to be the best as the losses in this case are comparatively small.

*Assam.*—The producers in Assam do not generally store potatoes for long but dispose of them as soon as they are harvested. They keep just sufficient quantities to meet their yearly requirements for seed and table purposes. These are carefully stored over bamboo *machans* (platforms) which are built inside their houses and are usually plastered with a mixture of cow dung and earth. Some of the producers put a layer of dry sand over the *machans* before spreading out the potatoes to reduce the percentage of damage. Those who do not have sufficient room in their houses sow the tubers in August or September, and harvest the crop in December and January. The yield of this crop is usually a little more than the quantity of seed planted. The main idea in raising this crop is to take over the seed from one season to another which otherwise can not be stored for want of space.

*Bombay.*—The methods of storage differ considerably from place to place. In Poona, which is the most important district for potato cultivation in the province, potatoes are sometimes stored in houses either loose on the floor or in gunny bags. Generally, they are stored in pits, 18" deep and 2½ to 3 ft. wide, dug out in the fields. The length of the pit depends on the volume of the produce to be stored. The pit is filled with water which is allowed to soak for five days. When it is dry, *neem* leaves (*Azadirachta indica*) are spread at the bottom and the sides to avoid the tubers coming into direct contact with the soil. Selected tubers which have been previously dried are heaped in the pit, usually up to a height of 3 to 3½ feet, and are covered with a thick layer of grass or *kadbi* (*jawar* stalks). A ditch is then dug round the heap at a distance of one or two feet and is occasionally filled with water. Sometimes, when it is very hot, water is sprinkled also on the top of the heap to bring down the temperature. As far as possible, the heap is not disturbed until the potatoes are finally taken out for sale. The potatoes are inspected by opening the top covering and picking up a few tubers by hand. If the potatoes are found to be attacked by moth (*Phthorimea operculella*), the cultivators try to sell their stock as quickly as possible.

To check the attack of the moth which is very common, some cultivators fumigate their produce with petrol, particularly if it is to be stored for seed purposes. In a number of villages permanent fumigation chambers have been

established and are in charge of village committees. They are built of bricks and are lined with cement plaster to make them air-tight. They are cylindrical in shape with an internal diameter of seven feet and a depth of six feet (see diagram facing this page) and have a capacity for  $2\frac{1}{2}$  tons of potatoes packed in bags. On the top the wall has a depression which is filled with water. The cover of the chamber is made of iron or wood with an iron ring which fits into the depression making the chamber air-tight. Several tin trays containing cotton wool are placed in different parts of the chamber and about  $2\frac{1}{2}$  pints of petrol is poured over the cotton wool. The cover of the chamber is placed in position immediately after the potatoes and the trays have been put in. The chamber is left undisturbed for 24 hours. The moths and caterpillars are killed by this treatment but the eggs remain unaffected. To get rid of the moth completely a second fumigation is necessary after about ten days by which time the young ones hatch out.

In the Poona district, a large part of the winter crop is stored and the stocks are gradually released for the market till July. The produce of the summer crop which is rain-fed is not generally stored to the same extent as it does not keep well.

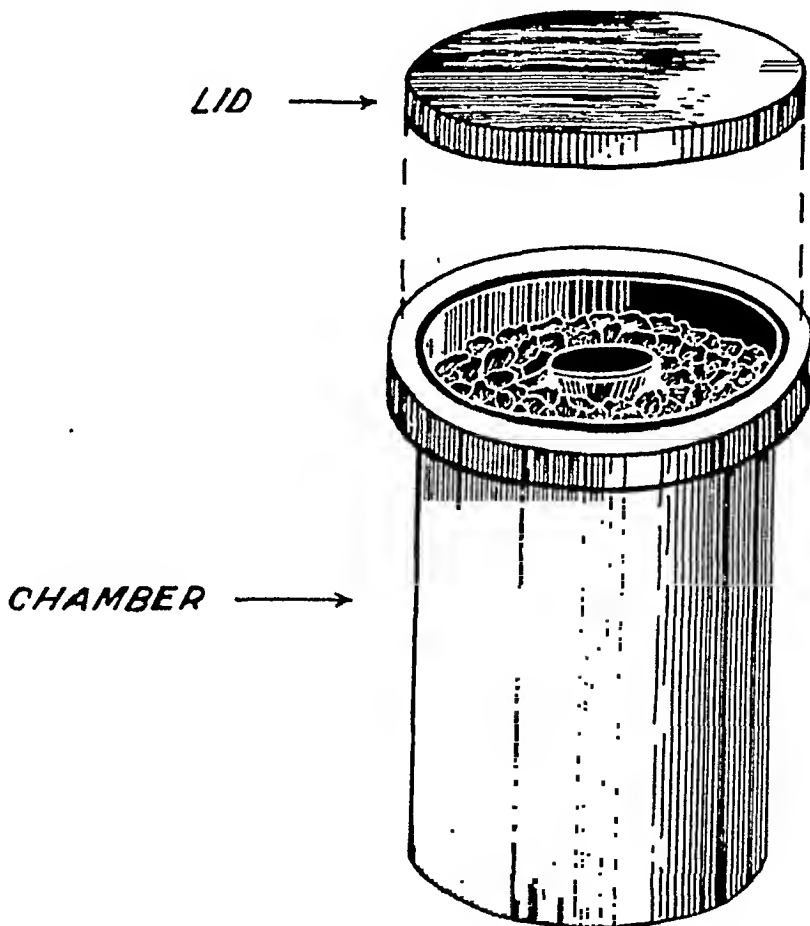
In the Ahmedabad district, where potatoes are grown in the river bed of the Sabarmati, temporary sheds with the roof and sides thatched with grass are constructed in the fields and the produce is heaped in them till about June. During this time they are continuously turned over every five or six days, and the decaying tubers are removed. After about the middle of June when the monsoon breaks, the stocks are removed to more permanent sheds of corrugated sheets for fear of floods in the river. Water has to be sprinkled every now and then to keep down the temperature. The potatoes are said to keep better when spread out over a layer of sand 4 to 6 inches deep.

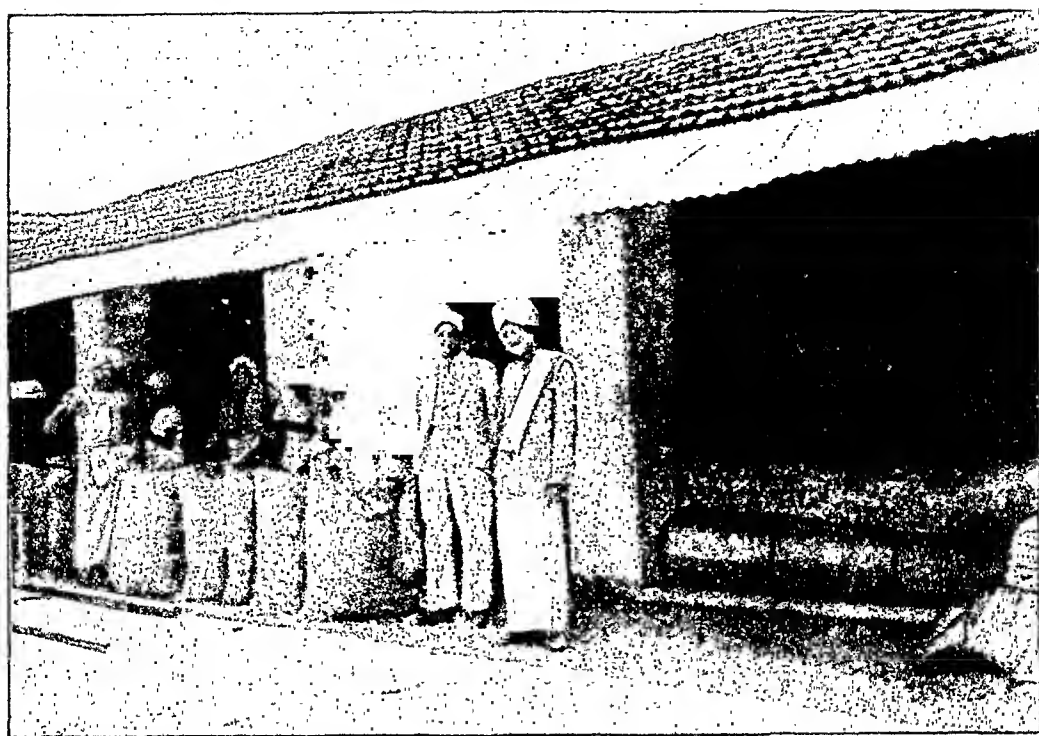
In Wathar, Koregaon, Belgaum and Dharwar, potatoes are generally stored in bags in the houses of the cultivators. These bags are emptied out every ten or fifteen days and the damaged tubers are removed. In the Wathar and Koregaon districts, the produce of the winter crop, which is usually small, is retained largely for seed purposes and is stored in pits in a similar manner as in Poona.

*Madras.*—In Madras, potatoes are not stored by growers for any length of time for want of storage accommodation in the hills, indebtedness to the merchants and the need for ready cash. The merchants at Mettupalaiyam, however, store the potatoes for short periods. This is done mainly with a view to allow the hardening of the skin and the culling of the tubers before shipping the produce to the consuming markets. The stocks are usually kept for a fortnight or so, depending upon the tone of the consuming markets. The merchants at Mettupalaiyam have large godowns which are open on one side (see plate facing page 139). On arrival, the potatoes are spread out in the open and are left there for a few hours to dry. They are then sorted into different grades (for details see Chapter on "Grading and standardisation"), and are finally heaped in the godown to a depth of 2 to 3 feet. (See plate opposite page 139). Strictly speaking, the keeping of potatoes at Mettupalaiyam for a short period cannot be regarded as storage in the ordinary sense of the word, but should be considered as a stage in the preparation of the produce for the market.

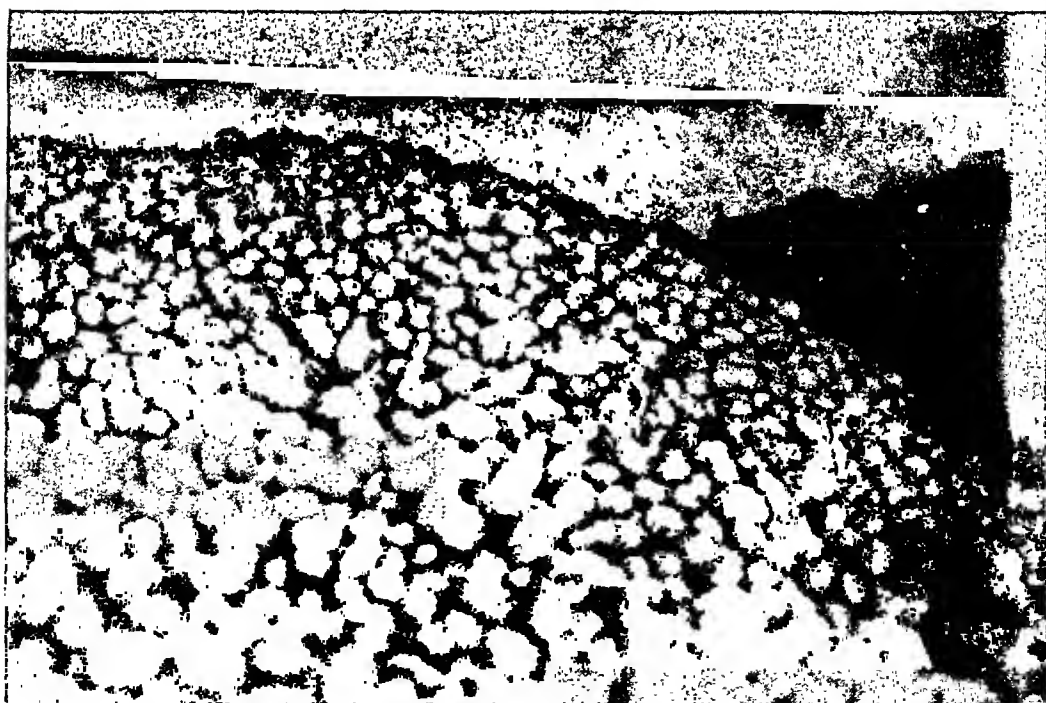
*Punjab.*—The growers in all the important potato producing districts in the Punjab store a part of their main crop and sell it when the prices improve. The period of storing usually extends from the middle of January to the middle of March. The summer crop which is harvested in May is not stored for

*SKETCH OF CHAMBER USED FOR  
FUMIGATING POTATOES.*





A GODOWN OF A POTATO MERCHANT, METTUPALAIYAM.



A HEAP OF POTATOES INSIDE A GODOWN OF A POTATO MERCHANT.

more than a month or so, on account of the prevalence of high temperature. The storing is done in *kothas* which are built in the fields. These are *kachcha* rooms made of mud walls, and are rectangular in shape. Well-to-do growers use rooms built of bricks. Ventilation is rarely provided. The potatoes are filled loose in the *kothas* and are stacked up to a height of three to four feet during summer. If filled to a greater height, they decay rapidly. On account of a very long and hot summer the seed potatoes cannot be stored economically under ordinary conditions. Need for cold storage facilities is being keenly felt. Early in 1939, a cold store capable of holding 2,000 maunds of potatoes was opened at Sialkot. In the first year, about 11,000 maunds of potatoes were stored by the producers. There is great scope for further development of this method of storage.

*Sind.*—Potatoes cannot be stored in Sind for a long time on account of a very hot summer. In certain tracts such as Bagirji and Piryalo, they are kept for a couple of months in *kothas* (ordinary rooms made of mud) where they are spread out on the floor. In the Malir tract small quantities amounting to about 1,000 maunds only are stored in sand for seed purposes. The method of storing is similar to the one followed in Bihar, with the difference that the potatoes are not taken out of sand till the time of planting. Occasionally the heap is turned over to pick out the diseased and damaged tubers. As the prices of seed potatoes are generally high as compared with the prices of potatoes at harvest time, some cultivators keep their own potatoes for seed but their number is small. There are two cold stores in Karachi where some of the Malir growers store their seed potatoes. In 1939, about 5,304 maunds of potatoes were stored there out of which 3,933 maunds were for seed and 1,371 maunds for table purposes. The damage in the cold stores is negligible and germination of stored seed potatoes is satisfactory. The cultivators are satisfied with the results and it is hoped that cold storage would become more popular in the near future.

*Central Provinces.*—In the Central Provinces very small quantities of potatoes are stored for seed or table purposes for fear of attack by the potato moth. The most common method of storing the table potatoes is to spread them out evenly on the floor in a cool room. The stock is periodically inspected and damaged and rotten tubers are removed. During monsoon the tubers give out sprouts which are broken off from time to time.

Formerly, the cultivators used to store their own potatoes for seed purposes and obtain fresh seed after about two years or so. But on account of the moth, potatoes are not stored in large quantities now. The method of storing commonly followed is as under.

After harvest, sound tubers are selected for seed purposes and are dried in a low structure roofed with branches and leaves, etc., to protect them from the direct rays of the sun. They are then spread out one foot thick on the floor of a room which may be *kachcha* or *pucca*. The storing room is kept closed and is opened only once a fortnight for removing the rotten tubers. Better class cultivators in Saugor and Murwara store their seed in thin layers over rough bamboo platforms constructed in their houses or cattle sheds. The layer of tubers is about 6 inches deep and is sometimes covered with bamboo matting.

In Khamla, where only the rain crop is grown, a small quantity is sometimes stored for the following year's crop, the method of storing being somewhat different. The tubers are tied up in bundles of twelve seers and wrapped in rice straw. These bundles are kept in a cool place and opened up only at planting time.



The Department of Agriculture has recently introduced an improved method of storage which is being gradually adopted by the growers. In principle this method is the same as that followed in Poona. The main difference in the two methods is that the pits in the Central Provinces are dug 24 to 30 inches deep, while in Poona they are only 18 inches deep. Moreover, the potatoes in Poona are heaped to a height of  $2\frac{1}{2}$  to 3 feet while in the Central Provinces they are heaped up to 6 inches below the neck of the pit. Another important difference is that in the Central Provinces bamboo shaft chimneys are used for ventilation. Potatoes kept in pits sweat due to the processes of transpiration and respiration, and the moisture thus accumulated causes rotting. To avoid sweating and to have free aeration in the pit, pieces of hollow bamboo shafts with the septa at the nodes removed and having holes in the sides are used to serve as chimneys or ventilators (see plate facing this page). The bamboo shafts or chimneys are about four to five feet in length and come out through the roof of the pit. The nodal septa are easily broken off by forcing an iron rod through the openings at the cut ends or by splitting the bamboo longitudinally and tying the two component parts together to keep them in position. Holes are bored or cut in the sides, one hole to each internode on alternate sides. These shafts are placed vertically in the pit, three or four feet apart. The pits are then filled with potatoes and covered with a layer of dry leaves of sugar cane of 8 to 12 inches thickness. The leaves are kept in position by placing over the pit a cover made of some thatching material like dry grass or leaves held together in a framework of split bamboo sticks. Bricks or stones are placed on the corners to prevent the covers from being dislodged by animals. The holes on the exposed parts of the bamboo shaft which protrude beyond the roof of the pit are covered with a wire gauze, so that insects may not enter the pits, but fresh air may circulate. To protect the pits from rain and the direct rays of the sun, they are preferably made under the shade of a tree (see plate facing this page) or if this is not possible, under a temporary shed made of branches (see plate facing page 141).

The potatoes are not left in the pits after the monsoon breaks out as the tubers sprout rapidly on account of humidity.

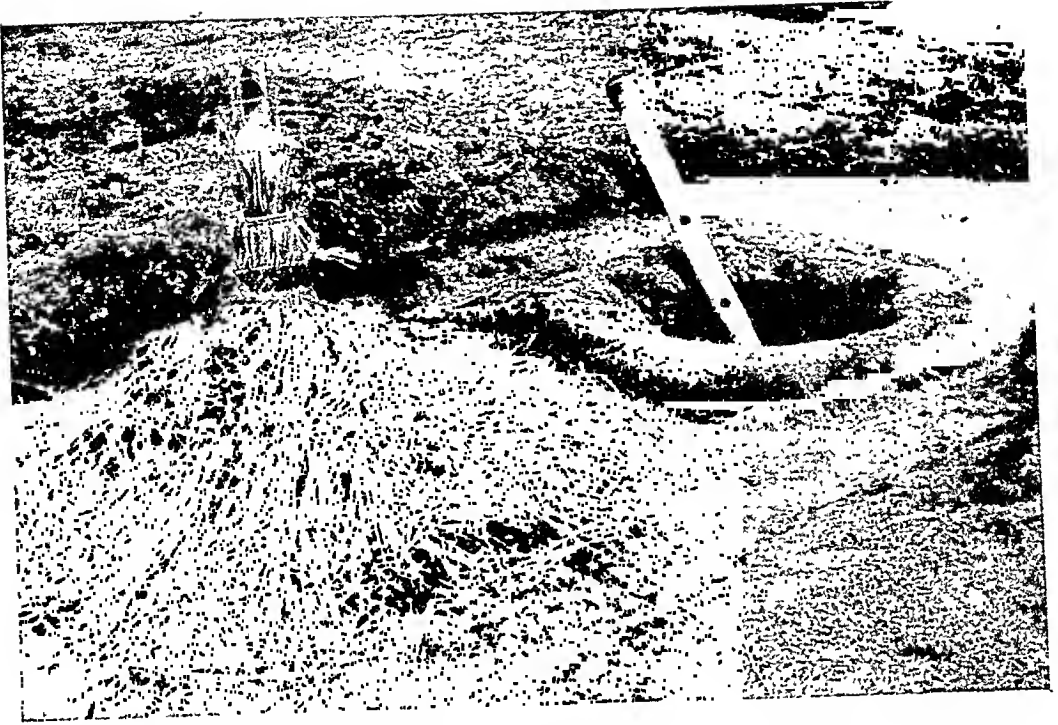
On being taken out from the pits the potatoes are spread on the floor for about a fortnight, and then put 9" thick between layers of sand spread on bamboo *machans*. The tubers are taken out once a fortnight to pick out the rotten ones. In September, they are finally taken out for being planted.

The chief merit of this method consists in the provision of the bamboo chimney which considerably reduces the temperature during the hot months by allowing proper ventilation in the pits. It seems desirable that this method should be tried elsewhere where potatoes are stored for seed purposes and the losses are heavy.

As the wastage in storage is usually high during the rainy season, storing of potatoes in sand, saw dust and ash was also tried; sand proved to be more useful.

*Orissa.*—In the province of Orissa very small quantities of potatoes are stored. The method of storage is similar to that prevalent in Bihar.

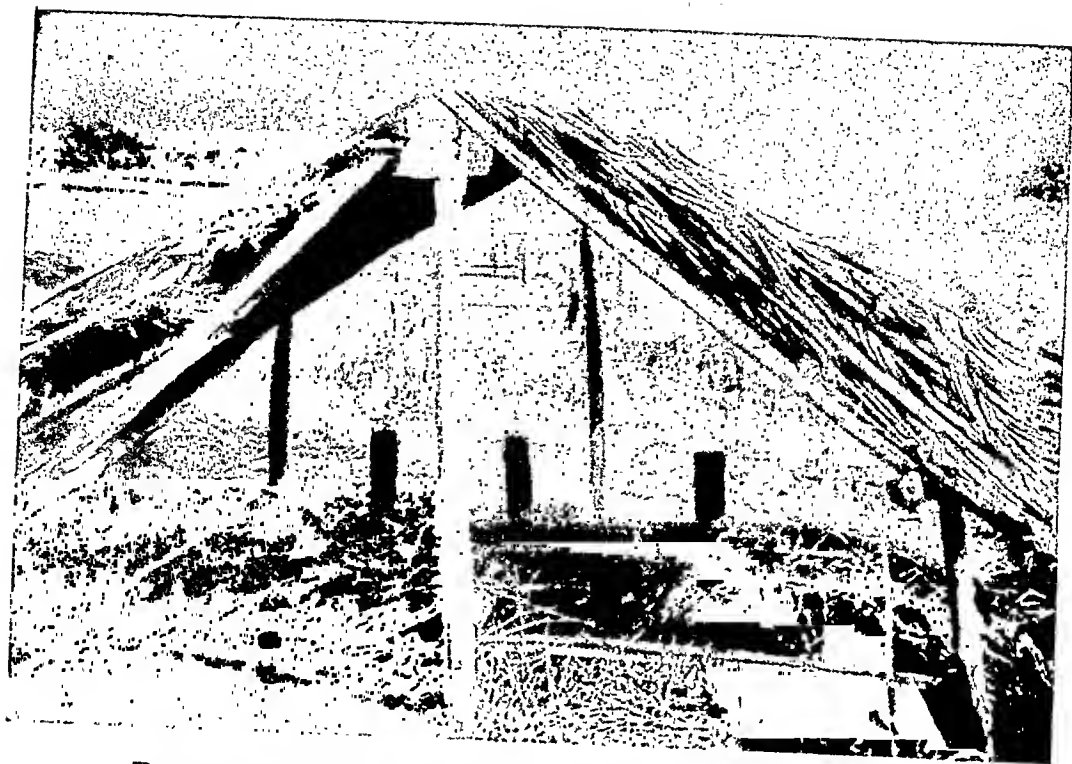
*North-West Frontier Province.*—The question of storage of potatoes differs from one locality to another according to requirements and climatic conditions. In the Hazara district, potatoes are mostly stored for seed purposes and owing to the fairly low temperature of the place there is comparatively less wastage in storage. There, the potatoes are usually stored in *kachcha* houses or in the cooler rooms of godowns. At certain places, potatoes



BAMBOO SHAFT LYING IN A PIT PREPARED FOR FILLING IN POTATOES.



PITS UNDER THE SHADE OF A TREE.



PITS UNDER A TEMPORARY SHED MADE OF BRANCHES.



HEAP OF POTATOES IN A FIELD.

are even buried in the soil. There are no cold storage facilities available in the province.

*Baluchistan.*—The producers seldom store potatoes for any length of time. A few who do store, do it in a crude method. A pit is dug in a protected place and the tubers are placed in it and covered with earth. It is presumed that there is a loss of about 10 per cent during two months' time. There is no cold storage arrangement in this province.

*Mysore.*—The table potatoes are stored for about a couple of months and those for seed for the whole season, i.e., till the planting of the next crop. In both cases they are spread out in layers 1 to 1½ ft. in depth. The rooms selected for storing are usually surrounded by several other rooms to ensure low temperature. Once a fortnight, the potatoes are turned over and the rotten ones are removed.

*Nizam's Dominions.*—The potatoes for table purposes are stored for a short period. The storing room is usually a dark ill-ventilated chamber or is a godown where other farm produce or implements are kept. The potatoes are heaped 2½ to 3 feet high and are covered with a layer of grass to reduce shrinkage (see plate facing page 141).

*Burma.*—In Burma, the potatoes for table purposes are sold soon after harvesting, and it is not usual to store them for any length of time. When, however, the growers are not able to sell the produce immediately after harvest they generally keep it in their living rooms and leave it uncovered. Well-to-do cultivators have separate sheds for storing purposes.

Potatoes for seed purposes which have to be stored are spread out on the floor of a dark room and the loss is considerable. The pitting method recommended by the Department of Agriculture, Central Provinces, has been recently tried with some success.

## B.—Cost of storage.

The cost of storage is an important factor as it influences the decision of the growers and the merchants whether or not to store the produce from season to season.

With the data available it is difficult to assess accurately the cost of storage by different methods. The main difficulty is that the growers themselves do most of the work connected with storage. No accounts are maintained of the various factors which go to make up the cost and sometimes the items themselves are quite indistinguishable from one another. An attempt has, however, been made to estimate the cost as accurately as possible.

For storing 100 maunds of potatoes in sand, the growers need roughly two cart-loads of sand which they usually bring in their own carts. Taking the cartage of sand at Rs. 1-8-0 per load, the cost of two cart-loads comes to Rs. 3. The potatoes have to be taken out of sand every fortnight and in about six months' period this will have to be done 12 times. Assuming that three coolies can take out 100 maunds of potatoes from sand and then put them back, the cost on this account will amount to Rs. 13-8-0 taking the rate of wages at six annas per diem. The *machan* costs about Rs. 15, but as it is a semi-permanent structure, the depreciation is only about 33 per cent. The cost per season, therefore, amounts to Rs. 5. According to the above estimates, the cost of storing 100 maunds of potatoes for six to seven months amounts to Rs. 21-8-0. Apart from loss due to damage, the cost per maund, therefore, comes to a little over 6 pies per month.

The cost of storing 500 maunds of potatoes on bamboo *machans* in Bengal has been estimated as follows :—

	Rs.
Erection of a thatched house with bamboo walls and <i>machans</i> 18 ft. × 12 ft. . . . .	50
Cost of labour for spreading and picking up rotten and decomposed potatoes, etc., once a week, for 3 months, at 50 maunds per labourer paid at 4 annas per day . . . . .	30
<b>Total</b> . . . . .	<b>80</b>
<i>Less</i> the value of the house at the end of season . . . . .	30
<b>Net cost</b> . . . . .	<b>50</b>

The estimated cost of storing 500 maunds of potatoes for the season (3 months) will, therefore, be Rs. 50, *i.e.*, the cost per maund per month will be about 6 to 7 pies only.

In pitting the potatoes as in Poona, the work of digging, etc., is done by the cultivator himself. He does not, therefore, spend anything but if his own labour is taken into account the cost amounts to about 3 pies per maund per month. In the case of the Central Provinces, where the pitting processes are somewhat laborious and the pits are dug deeper, the cost per maund per month works out at about one anna.

It would thus appear that the cost of storing potatoes varies from 6 pies to 1 anna per maund per month. This amount is practically negligible as compared with the rise in prices as the season advances. But the losses in storing under the present conditions are heavy and constitute the greatest factor in the cost of storage.

### C.—Loss in storage.

It is difficult to assess the exact amount of loss in storage as it depends on a number of factors, the most important being temperature, humidity, freedom from soil and moisture, aeration and exclusion from light.

#### (1) TEMPERATURE.

About 36°F. is considered to be a suitable temperature for storing. If it rises above this, the percentage of rotting increases, and if it goes down there is an appreciable accumulation of sugar in the tuber which imparts a more or less sweet taste to the potatoes when cooked. If, however, such tubers are exposed for a week to a temperature of 70 to 75°, four-fifths of the sugar accumulation is transformed into starch. Under the existing conditions in India, the temperature during storage period is rarely below 32°F. From Appendix XXV it will be seen that in most of the potato producing areas, the maximum temperature during summer, *i.e.*, May to October, is very high. The losses are, therefore, enormous and the cultivators have to take special pains to carry over the stock of seed potatoes from one season to another. As will be shown later, it is almost impossible in certain cases to keep the seed potatoes from the harvest of one crop till the planting of the next crop. There are also natural losses in the weight of potatoes due to the transpiration and respiration processes. These losses are inevitable, but they vary considerably depending upon the temperature. Other factors of importance in connection with the loss in weight are variety, maturity and character of the skin of the tuber.

Butler\* conducted certain experiments on the relation of temperature to loss in weight of *Green Mountain* potatoes placed in storage at three different temperatures. They showed the following percentage losses :—

*Effect of temperature on respiration and transpiration losses in potatoes.*

Mean temperature of storage	Percentage of loss in weight after						
	30 days.	60 days.	90 days.	120 days.	150 days.	180 days.	210 days.
39°F. . . . .	0.58	1.43	1.43	2.29	2.58	2.15	2.44
48°F. . . . .	1.26	2.53	3.37	4.21	7.18	..	..
60°F. . . . .	1.52	2.77	4.01	6.65	11.56	..	..

It is evident from the above table that the percentage of loss increases with the temperature. In 5 months' period the loss at 60°F. was 11.56 per cent, and would be still greater at higher temperatures. Unfortunately, there are no data to show the exact decrease in weight at the higher temperatures at which the potatoes are normally stored in India.

## (2) HUMIDITY.

The presence of a proper amount of moisture in the air where potatoes are stored is of great importance. Too little moisture causes shrivelling and too much affects the colour and induces sprouting. Cooper\* suggests that a humidity from 85 to 90 per cent is suitable when the temperature ranges from 30 to 35°F. This suggestion coincides with the observations made in the cold storage experiments conducted at Poona where the best results were obtained when the humidity varied between 80 and 90 per cent. Under the existing conditions of storage it is not possible to control the humidity. It will be seen from Appendix XXV (see also diagram facing page 144) that during the early part of storing, i.e., March to July, humidity in all the centres where potatoes are stored is below 80 with the result that the potatoes shrink enormously. From July onwards till September, which is the rainy season, the humidity is high, and due to this and high temperatures sprouting starts and the cultivators have to keep on breaking off the sprouts to retain the vigour in the tubers.

## (3) AERATION.

A good supply of pure air is necessary, where potatoes are stored. According to Stewart and Mix, the "black heart" or heat rot in storage is due to lack of aeration and rise of temperature.\*

The damage resulting from insufficient aeration is due to lack of oxygen. Potatoes stored in bags or big heaps rot more than those spread out in thin layers. In order to ensure an ample supply of pure air in the storage house, adequate provision should be made for ventilation beforehand. Light should,

\*F. C. Stewart and A. J. Mix—Black Heart and the Aeration of potatoes in storage. New York Agriculture Experimental Station Bulletin No. 436 (1917).

however, be excluded, for potatoes intended for table purposes are damaged by exposure to light. This fact is generally realised by the cultivators and as far as possible potatoes are stored in dark rooms. But this is done at the cost of proper aeration.

Seed potatoes are, however, not injured by light. In fact, the European growers purposely expose their seed stock to light as this hardens the skin, retards sprouting and retains the vitality of the seed. In India also this practice is followed to a certain extent.

#### (4) SOUNDNESS OF TUBERS.

One of the important causes of rotting is the storage of unsound tubers which may be mechanically injured or diseased. The losses resulting from the mechanically injured tubers are largely dependent upon storage conditions. If, for instance, the storage house has been carefully disinfected, the chances of infection of the cut or bruised surfaces are largely eliminated. On the other hand, if the storage houses are insanitary, the cut surfaces offer an easy source of infection for a number of decay organisms. Much also depends upon temperature and humidity. If these are high, the shrinkage will be much greater than when they are of the right degree.

The cultivators sort out roughly the diseased and damaged potatoes before placing them in the store rooms. But they have no idea about the disinfection of stores. Very often germs of diseases and insect pests which inhabit the store rooms start their work of destruction immediately the potatoes are brought into the store. As will be shown later, the potato moths, which remain hidden in the crevices of the store, cause tremendous damage every year. In certain parts of the Central Provinces, the growers who used to store large quantities of seed have given up storing on account of the damage caused by the moth.

#### (5) FREEDOM FROM SOIL AND MOISTURE.

It is a common practice to harvest the crop when the soil is somewhat moist. A certain amount of the soil, therefore, remains sticking to the tubers. When potatoes are stored wet with large quantities of soil adhering to them, they develop a considerable amount of heat, especially if stored in bulk, and rot rapidly. Piles of potatoes stored in this condition may cause a large volume of steam to escape as might ordinarily be expected from a pile of fermenting manure. In such cases, losses on account of transpiration and soft rot are great. The cultivators as a rule gather the produce as soon as it is harvested. This practice leads to losses. The potatoes in Farrukhabad and Poona districts, where the soils are somewhat heavy, carry a good quantity of earth with them. It is desirable that the crop should be harvested in such a manner as to ensure freedom from moisture and wet soil. Before storing, the potatoes should be kept in the open for a few hours to allow the excess moisture to dry up and to get rid of as much of dirt and wet earth as possible.

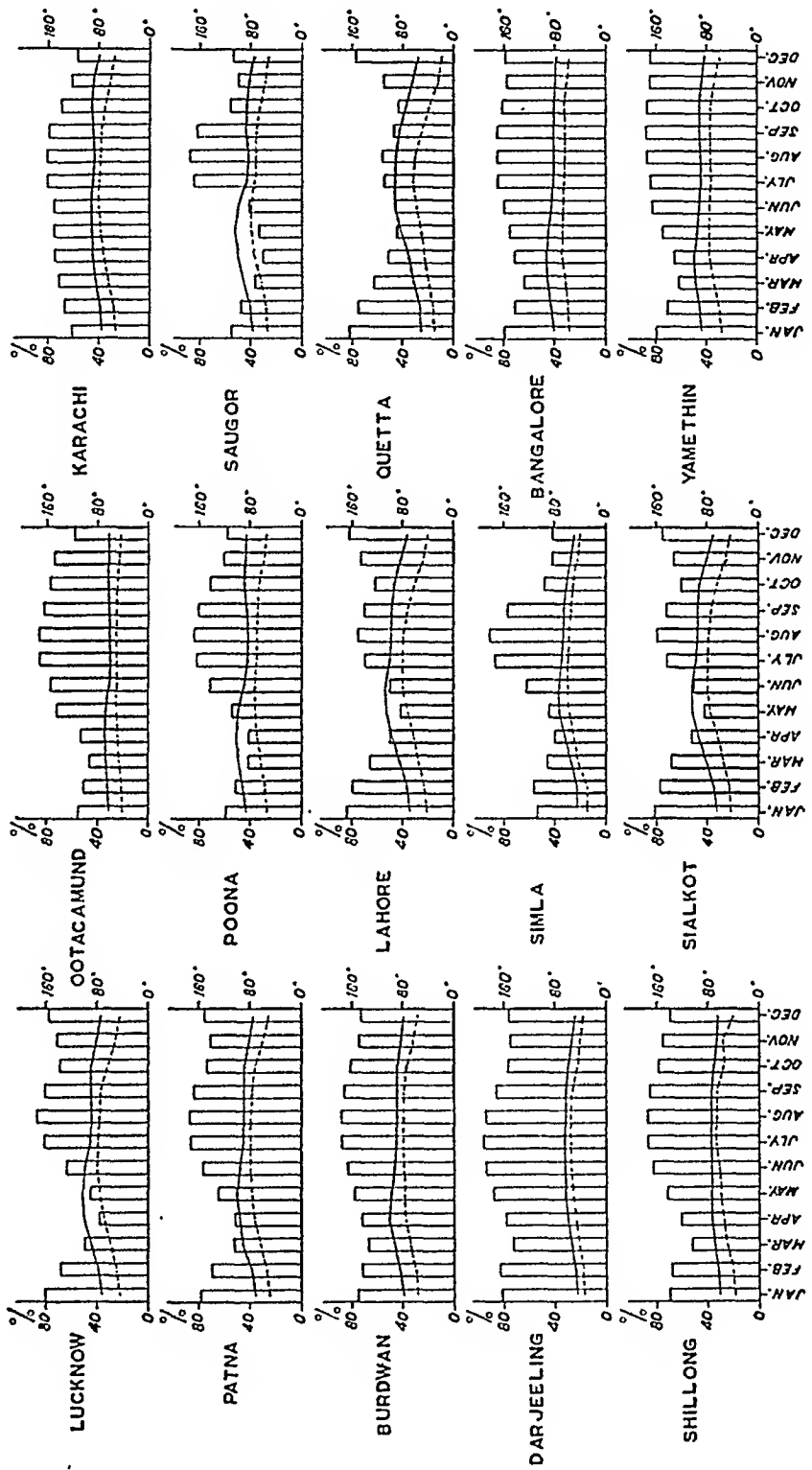
Enquiries from growers and others regarding losses in storage of potatoes on account of temperature, diseases, etc., have invariably elicited the reply that no definite efforts have been made to determine the losses either collectively or separately. The difficulty of assessment is also due to the lack of proper records maintained by the cultivators. The figures given below should be regarded as rough estimates based on extensive enquiries from the interests concerned. It is generally believed that losses due to decay and shrinkage from March to June, i.e., after harvesting up to the outbreak of monsoon vary

# HUMIDITY AND MAXIMUM & MINIMUM TEMPERATURE AT CERTAIN IMPORTANT POTATO GROWING DISTRICTS.

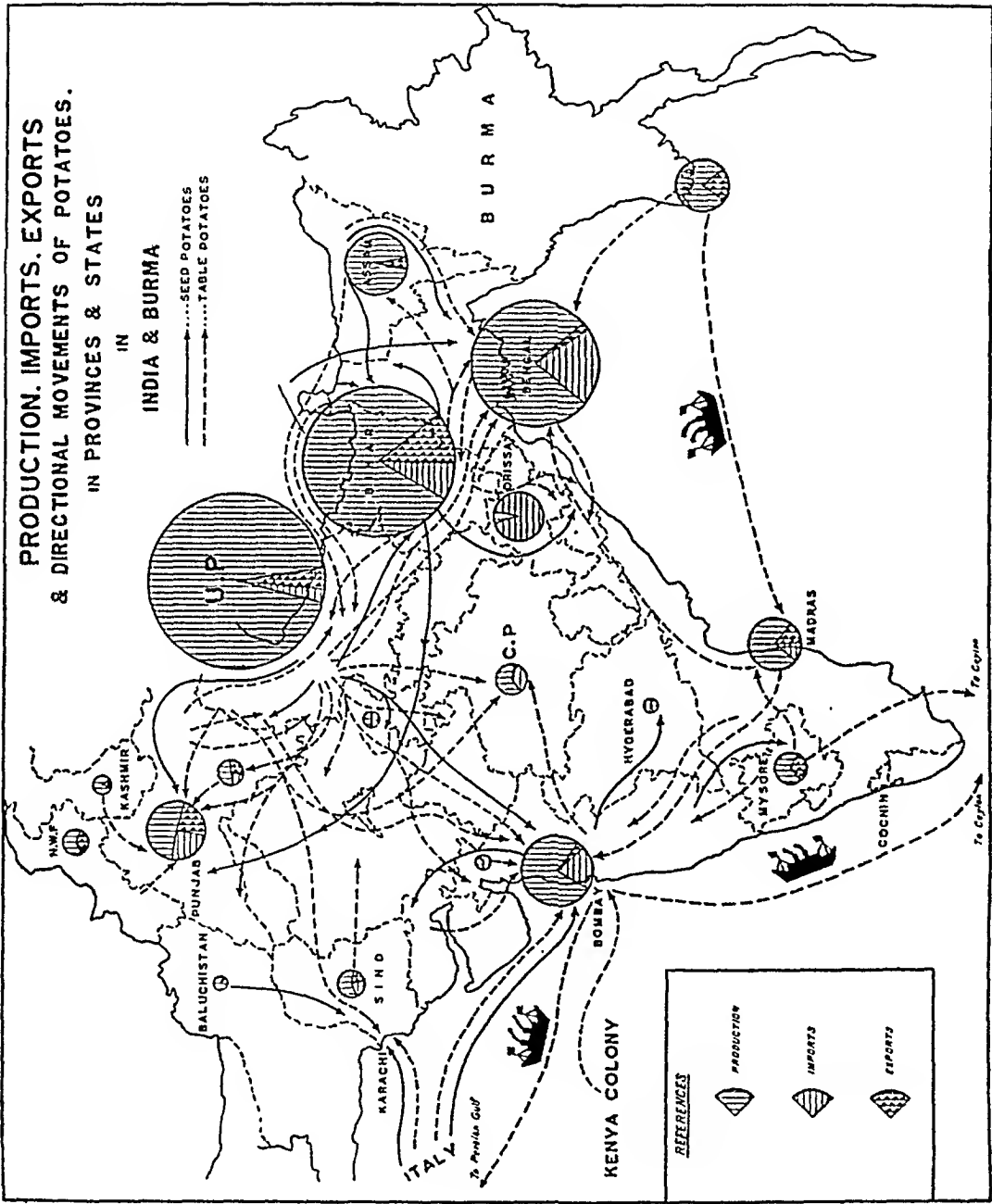
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☐ HUMIDITY.







from 25 to 40 per cent. If the potatoes are kept till September-October, as in the case of seed potatoes in the United Provinces, Bihar and Bengal, the losses are usually 50 to 65 per cent. In certain cases the losses are as high as 60 to 80 per cent and sometimes the entire quantity stored is lost.

The annual losses in storage are heavy in India as scientific methods are not adopted. The methods of storage practised in different parts of the country are different as also the losses. The annual losses in storage and in the process of marketing amount, at a very conservative estimate, to 8,553,100 maunds valued at Rs., 65,79,500.

In Bihar, where potatoes for seed purposes are stored in sand for six to seven months, losses due to rotting, etc., are very high. The following two examples are from cultivators who kept records of the quantities of potatoes stored and the quantities lost. One grower harvested 80 maunds of potatoes out of which he sold 36 maunds and kept the rest for seed. During the storage period of six months, 25 maunds were spoiled and only 19 maunds remained in a fit condition to be sold or used as seed. Thus the loss was 57 per cent. Another grower stored 130 maunds of potatoes for six months but only 56 maunds remained in good condition, the loss again being 57 per cent.

In Bengal, the loss in storing potatoes for table purposes in about 3 months, i.e., from March to June, is roughly 20 per cent. In the case of seed potatoes, which are stored for about 6 to 7 months, the loss is usually about 40 to 50 per cent. At Rangamati Agricultural Farm in Bengal, small quantities of seed potatoes of two varieties were kept in 1935-36 in a well-ventilated thatched hut on a *machan* and were covered with dry sand. The results are given below :—

Variety.	Quantity stored.	Wastage.	Quantity of sound tubers at planting time.
	Mds. srs.	Mds. srs.	Mds. srs.
Improved . . . . .	0 34	0 20	0 14
Local selected . . . . .	1 5	0 29	0 16

In spite of the proper arrangements that were made at the farm, the loss in the first case was 59 per cent and in the second 64 per cent.

In Poona district of the Bombay Presidency where potatoes are largely preserved in pits, the percentage of loss due to attack of moth and rotting varies enormously. If the pitting is not done carefully, the entire quantity of potatoes in the pit may be spoiled. The damage under normal conditions in about 4 months varies from 20 to 30 per cent.

In Ahmedabad district where the potatoes are stored for a couple of months after harvest in thatched sheds in the river bed and thereafter for a month under corrugated sheds, the loss in storing during the period, April to July, is usually from 25 to 30 per cent.

In the Punjab, potatoes are generally stored in *kothas* for one or two months. The loss in the case of the winter crop during the two months' storage in February and March is 12.5 per cent and in the case of the summer crop during one month of storage it is estimated to be about 20 per cent. The loss is greater in summer because of the higher temperature.

In the Central Provinces, where potatoes are stored in pits, the percentage of loss is considerably lower than that in Poona, where similar methods of storage are followed. Storing experiments were carried out for a number of years at Chhindwara and the results obtained are given below :—

*Results of storage experiments conducted at Chhindwara and Tamia (Central Provinces).*

Place.	Date on which stored.	Quantity stored (lb.)	Date on which taken out from the pit.	Quantity found sound (lb.)	Percentage of loss.*
Chhindwara . . . . .	February 1926	174	June 1926	128	26.4
Do. . . . .	„ 1927	334	„ 1927	311	6.9
Do. . . . .	„ 1928	493	„ 1928	429	13.0
Do. . . . .	„ 1929	1,784	„ 1929	1,400	21.5
Do. . . . .	14th March 1936	240	20th June 1936	227	5.4
Tamia . . . . .	14th March 1936	3,972	17th June 1936	3,272	17.6

\*Average percentage of loss = 15.1.

It will be seen that the percentage of loss has varied from 5.4 per cent to 26.4 per cent in about 4 months' storage. The average loss on the basis of the above results works out at about 15 per cent which is only  $\frac{1}{2}$  or  $\frac{3}{4}$ ths of the loss at Poona which is usually from 20 to 30 per cent. In view of this low percentage of losses in the Central Provinces, it would be advantageous if the improved methods of storage employed there were adopted in Poona and elsewhere where the pitting method is practised. In the Central Provinces, experiments on storing seed potatoes during rains, i.e., from June to September, in sand, saw dust and ash were conducted at the Government Experimental Farm, Chhindwara, and Demonstration Plot, Tamia. The percentage of loss in different cases is shown below :—

*Percentage of loss during storage of potatoes in sand, saw dust and ash during monsoon.*

Place.	Year.	Sand.	Saw dust.	Ash.
Chhindwara . . . . .	1936	15.00	22.5	41.2
Do. . . . .	1937	24.00	22.0	27.0
Tamia . . . . .	1936	30.55	30.0	20.0
Do. . . . .	1937	28.34	30.0	30.0
Average . . . . .	..	24.47	26.1	29.5

From the above figures it will be seen that sand gave good results in some years, saw dust in others and ash in still others. The average percentage of loss on the basis of two years' experiments in the two places was lowest in the case of sand (24.47) and highest in the case of ash (29.5). In the case of saw dust the average percentage of loss was 26.1 per cent. On the whole, there is not much difference in the losses suffered in the three cases. Sand, which is used practically all over India, seems to be the best as it is easily available.

It is understood that the storing of potatoes in sand was first undertaken in Bihar. This works very well so long as the sand is dried before use. When, however, moist sand and silt (sand *plus* soil) from the river alluvium is used, the loss in storage is high. In the absence of any better method of storage it seems desirable to recommend the use of sand for storing purposes.

In Burma, the loss in storage of seed potatoes from the disease caused by the *Bacterium solanacearum* and from damage caused by the caterpillar of the potato moth (*Phthorimea operculella*) during the latter part of the rainy season, the winter and early part of summer is usually high. Storage experiments were conducted for a number of years at Yawngghwe Agricultural Station, and the results are given in the statement on the following page :—

*Statement showing the loss in storage at Yawnghwe Agricultural Station, Burma.  
(1924-25 to 1927-28.)*

Name of varieties.	1924-25			1925-26			1926-27			1927-28			Average loss. (Per cent.)
	Stored.	Lost.	Per cent- age of loss.	Stored.	Lost.	Per cent- age of loss.	Stored.	Lost.	Per cent- age of loss.	Stored.	Lost.	Per cent- age of loss.	
Ally . . .	251	67	26.69	2,016	852	42.26	976	327	33.50	4,559	1,347	29.55	33
King of potatoes .	1,076	518	48.14	756	425	56.22	646	286	44.27	180	93	51.67	50
King George .	256	179	69.92	561	287	51.16	35	21	60.00	43	20	46.51	56.9
Up-to-date . .	1,154	488	42.29	45	24	53.33	35	25	71.43	101	63	62.38	57.36

From the preceding statement, it will be seen that the percentage of loss has varied from 26·69 to 71·43 per cent. In one case it is over 70 per cent and in several others over 50 per cent which also is rather high. This experiment also shows the differences in the keeping quality of different varieties. For example, in the case of *Ally* the loss averaged 33 per cent, for the *King of potatoes* 50 per cent and for *King George* and *Up-to-date* the loss was about 57 per cent in each case.

From the foregoing discussion regarding loss in storing, it is quite clear that huge quantities of potatoes run to waste annually during storage. The problem of storage is rendered difficult due to the main crop in India being followed by a long and hot summer. It is, therefore, necessary that proper arrangements should be made for storage under low temperatures. The possibilities of utilising cold store facilities for potatoes are discussed later. There is, however, scope for reducing the loss under the existing methods also if proper care is taken in selecting good potatoes. The following hints on storage of potatoes may be of some use :—

1. Well-ripened tubers should be selected.
2. Before storing, the tubers should be dried and cleaned of dirt.
3. All diseased, bruised and cut tubers should be removed and only clean and sound tubers should be selected for storage.
4. *Storage room.*—(a) The store room should be situated in a dry and cold place, preferably under the shade of a tree or surrounded by other buildings. Underground cellars have a low temperature and are well suited, provided they are not damp.
- (b) The floor should be plastered, or preferably cemented, and should be absolutely dry.
- (c) The room should be well ventilated and all doors and ventilators should have wire gauze of fine mesh to prevent entry of potato moth, etc.
- (d) There should be no holes on the walls where the insects might take shelter.
5. The store room should, if possible, be fumigated with sulphur fumes, and while fumigating, all doors and ventilators should be closed.
6. The ventilators of the rooms should be opened every morning and evening but should be kept closed during the day.
7. The potatoes should be stored in dry sand as far as possible as it protects them from the attack of moth and keeps them cool. If they are not kept in dry sand, they should be fumigated with petrol.
8. The potatoes should not be heaped more than 9 to 12 inches deep.
9. The potatoes should be inspected periodically to remove rotten and diseased tubers which should on no account be left in the godown.

#### D.—Cold storage.

##### (1) PRESENT PRACTICE IN REGARD TO COLD STORAGE

From the discussion on methods of storage practised in India, and the losses sustained in the different cases, it is evident that the conditions of storing potatoes in summer months in India are far from satisfactory. The main problem is to protect them from high temperature in the summer months. A careful review of the situation suggests that the solution of the problem lies

in storing potatoes at low temperatures. At present cold storage facilities exist at the port towns but they are not generally availed of for storing potatoes except in Karachi. There are several reasons for this. Firstly, the people do not fully realise the advantages of cold storage and no one, till recently, had seriously thought of utilising the cold stores for storing a cheap and semi-perishable commodity, such as potatoes. Further the port towns where the cold stores are located are at long distances from the main producing centres, and the cost of transport to the cold store including the rent of storing have been regarded as high.

The importance of cold storage of potatoes is being realised, and in recent years cold stores have been erected in certain important potato producing centres such as Meerut, Sialkot, Patna and Jammu. The results achieved at these places indicate the possibilities of extending this facility to other parts as well. The second argument regarding the distance of the existing cold stores seems to be more or less correct and has been one of the main causes for not utilising the existing cold stores for keeping potatoes. In Sind, where the main potato producing area is within a short distance from Karachi, the growers have been freely utilising the cold storage facilities both for table and seed potatoes. This is in spite of the fact that the margin between the prices of potatoes at harvest time and of seed potatoes at the planting time has not been so great in this area as in the case of the Punjab, the United Provinces and Bihar. The differences in prices on the average are Rs. 4 per maund in Sind whereas in other provinces they are as great as Rs. 7 to Rs. 10 per maund. The storing of potatoes in cold store at Karachi on a commercial scale was taken up as early as in 1932. The quantities stored since then in different years are given below :—

*Quantities of potatoes stored in cold store at Karachi.*

1932-1939.

(In maunds).

Year.	Seed.	Table.	Total.
1932 . . . . .	3,614	877	4,491
1933 . . . . .	532	300	832
1934 . . . . .	233	290	523
1935 . . . . .	1,369	1,282	2,651
1936 . . . . .	4,842	2,372	7,214
1937 . . . . .	2,287	1,000	3,287
1938 . . . . .	2,666	2,095	4,761
1939 . . . . .	3,933	1,371	5,304

The variations in the quantities stored from year to year are mainly due to the fluctuation in the area under potatoes, and also to the variations in prices of potatoes at the harvest time. The quantities stored in 1933 and 1934 were particularly low. This was due to some defect in the cold storage plant which could not be set right in time for storing the potatoes. However, from the quantities stored in other years it is evident that the cold storage

facilities if provided in other centres within easy reach of producing areas would be fully utilised. The other examples of the recent development of cold storage facilities in Meerut, Sialkot, Patna and Jammu further support this view.

The Meerut cold store was started in 1938. In that year 3,000 maunds and in 1939, 12,000 maunds of potatoes were preserved for seed purposes. The results achieved in these two years have been so encouraging that the proprietor is considering a scheme to enlarge the cold store. Another party in Meerut, which has been impressed with the success of the local cold store has planned to erect a store of 500 tons capacity at Hapur which is an important centre of potato cultivation.

The cold store in Sialkot was started in May 1939. Its capacity is 2,000 maunds, and in the first year 1,100 maunds were stored. The cold store in Patna was built in 1940. About 10—12 thousand maunds of potatoes were stored but owing to some defect in the machinery the temperature could not be brought down to the desired degree with the result that most of the potatoes stored for seed purposes started sprouting much before the planting time. The store at Jammu was started in 1936, and its capacity is 2,000 maunds. In the first two years the quantity stored was small but in 1938, it increased to 1,000 maunds. Jammu is not an important producing centre, but there appear to be good prospects for further development of cold storage facilities.

The stores at Meerut, Sialkot, Patna and Jammu have been built exclusively for potatoes and they are worked only so long as potatoes are stored in them. The proprietor of one of the stores stated that he was able to make a profit in spite of the short period for which the store was worked.

The problems of storing potatoes for seed and table purposes have to be considered separately.

(a) *Table potatoes*.—From Appendix XIII, it will be seen that the prices of potatoes in most of the markets are low from January to May and high from June to November. The difference in certain cases is as high as Rs. 2 per maund. Taking the cost of storage in cold store at 4 annas per maund per month, and the average period of storing at two months, the cost of storing *plus* other incidental charges including interest on capital would come to about 12 annas per maund. After meeting all expenses in this connection there still appears to be a margin of more than a rupee per maund.

A gentleman interested in cold storage in Calcutta, conducted an experiment in 1932 to see if it was economical to store potatoes. He bought 1,776 maunds of potatoes on 31st March at Rs. 2-12-0 per maund and stored them till 15th August. The loss in different bags varied from 2 to 5 per cent. Before sale the potatoes were sorted into large and small ones. The former lot was sold at Rs. 6-8-0 to Rs. 7 per maund and the latter at Rs. 5-8-0 per maund. Unfortunately, a complete record of all details of the trial is not available but from the rates at which the potatoes were sold, it would appear that there was a good profit even after deducting interest and the cold storage charges at 4 annas per maund per month. One party in Calcutta has this year (1940) stored about 3,600 maunds of potatoes in two cold stores. The small ones will be sold for seed purposes and the big ones for table purposes. The potatoes were put in the cold store in April and are intended to be disposed of in September and October.

Potatoes kept at low temperature for a considerable period accumulate sugar and taste sweet when cooked. If, however, they are exposed to ordinary temperature for a week, most of the accumulated sugar changes into starch



and the potatoes do not taste sweet. The same person in Calcutta buys a few bags of potatoes every year in March when prices are low and keeps them in the store for his own use till the new crop is harvested in September-October. He does not find any marked change in taste. The only defect which he has sometimes found is that chips made out of these potatoes become dark in colour and the mash made out of them is somewhat sticky. It seems desirable, therefore, that experiments should be conducted to see the effect of cold storage on the cooking quality of potatoes of different varieties when kept at various temperatures in a cold store.

(b) *Seed potatoes*.—Potatoes for seed purposes have to be preserved for six to seven months and the losses in their case are enormous under the present conditions. There is, therefore, a vast difference in the prices of potatoes at harvest time and at planting time, ranging from Rs. 2 to Rs. 9-9-0 per maund (for details see Chapter on "Seed"). This vast difference in the prices clearly indicates the possibilities of using cold stores for seed potatoes even with storage charges above 4 annas per maund per month.

Under the cold storage scheme at Poona which is financed by the Imperial Council of Agricultural Research, considerable research work has been done on the effect of storage temperature, on germinating capacity and the chemical changes that take place during storage. The results obtained are interesting and are briefly stated below :—

(i) *Temperature*.—It has been found that freshly harvested potatoes can be kept without sprouting for 3 or 4 months at 52°F., for 5 months at 45°F., for 7 months at 40°F. and for an almost indefinite period at 35°F.

The length of the period for which potatoes are preserved at ordinary temperatures, before being put into cold store affects the period of dormancy at different temperatures except at 35°F. at which the tubers remain dormant for an indefinite period. It was observed that potatoes remained dormant for 7 months at 40°F. when stored soon after harvest whereas those obtained from the same source but stored after exposure to ordinary temperature for 2 months began to sprout after 2 months.

Potatoes kept at a temperature of 30°F. to 32°F. suffer from internal breakdown and do not germinate if stored for three months or more. Good and satisfactory results are obtained by storing full grown, well developed and clean tubers. Immature tubers lose water rapidly, shrivel badly and are attacked by *Penicillium* fungus. If the tubers are properly selected the wastage due to rotting at about 35°F. and 40°F. is almost nil.

The loss in weight in storage during 9 months at 35°F. is about 10 per cent when potatoes are kept in open trays, and about 5 per cent if kept in gunny bags or crates at 40°F. The loss in weight is less in the case of big tubers than in the case of small ones. As, however, the difference is not great, the size of the tuber is not an important factor.

(ii) *Chemical changes during storage*.—At 35°F. there is a gradual accumulation of sugar, the tubers tasting sweet. After 7 months of storage the percentage of sugar is about 4 per cent. The tubers, however, lose a part of the accumulated sugar on being transferred to the ordinary temperature. At 40°F. the sugar content increases to a small extent during the first month but then it remains steady. The increase is generally not high at this temperature. In about 5 months' storage it increases from 0.162 per cent (present in the fresh potatoes) to 1.25 per cent. In the case of potatoes kept at 68°F., the percentage of sugar after 5 months' storing goes up to only 0.2 per cent. This shows that the accumulation of sugar is small at high temperatures.

(iii) *Germinating capacity*.—The germinating power of potatoes is not affected by cold storage at 35°F. even for a year. The length of the storage period, however, influences the rate of sprouting. The tubers stored at 35°F. and 40°F. had to be kept in the beginning at 68°F. for about four to five weeks to show good sprouting, but as the storage period advanced, the time required for sprouting was reduced. Thus in the case of potatoes stored for nine months at 35°F., the sprouting commences vigorously within a week after removal to 68°F.

## (2) COLD STORAGE CHARGES.

The cold storage charges vary from one cold store to another. At Karachi there are two cold stores. For small lots they charge 6 annas per maund per month and for big lots 4 annas per maund per month. The Cold Store at Meerut charges Rs. 4 per 100 lb. for the entire season, i.e., from April to first week of October. The monthly charges thus amount to 8 annas per maund. At Sialkot the charges are Rs. 4 per maund for the period from May to first week of October, the charges per month being Re. 0-12-3 per maund. In Jammu the charges are made in kind. Half the quantity stored is taken as the rent for the cold store. In spite of such high charges, however, it pays the growers to keep their seed potatoes in the cold store for if they were to keep their potatoes themselves, the loss might be 50 per cent or even more in certain cases. Moreover, the cultivators are saved from the worry and inconvenience of storing the produce in their own house. The cultivators in Meerut and Sialkot who have to pay 8 annas and Re. 0-12-3 per maund per month respectively, find it profitable to store their potatoes in the cold store as compared with storing it in their own houses, or buying the potatoes at planting time. The prices in these places at harvest time are roughly Rs. 1-8-0 per maund. They have to pay Rs. 3-4-6 per maund at Meerut and Rs. 4 at Sialkot as rent. The cost of the seed potatoes thus works out at Rs. 4-12-6 in the former case and Rs. 5-8-0 in the latter, whereas the price of the seed potatoes in the sowing season is Rs. 9 to Rs. 12 per maund in these markets. After allowing for interest of annas 2 on the value of potatoes, there is a clear saving of Rs. 4-1-6 to Rs. 6-6-0 per maund.

In Karachi, the cold storage charges vary from 4 to 6 annas per maund per month. This shows that there is scope for reducing the charges in Sialkot and Meerut. There is, however, one difference. While the Karachi Cold Store gets other articles also for storage, the Sialkot and Meerut stores are run only so long as the potatoes are stored and are not used for the rest of the year.

## (3) LOSS IN COLD STORAGE.

The loss in the case of potatoes kept in cold store is almost negligible as compared with the loss sustained otherwise. As already mentioned, the experiments performed at Poona show that the loss is 10 per cent in nine months if potatoes are kept in open trays at 35°F. and 5 per cent if kept in crates and gunny bags at 40°F. One of the cold storage companies at Karachi reported that there was hardly any loss in storing potatoes for six months. The Meerut Cold Storage Company has reported a loss of 6 per cent in six months' time. In an experiment conducted in 1932 by the manager of the Cold Storage Company, Calcutta, the loss in potatoes stored from March till August varied from 2 to 5 per cent in different bags.

According to the experiments and observations made by the commercial concerns, the loss in cold storage during 5 to 6 months may be taken as 2 to 6 per cent, which is very small as compared with the loss in storage by other methods.

## E.—Practice of storage in other countries.

### (1) ENGLAND.

The usual practice is to store potatoes on the farms in what are called pits, clamps, buries, pies, caves or grasses. A long shallow trench from 3 ft. 6 in. to 9 ft. 6 in. wide is dug, and the potatoes are put in a heap covered with good wheat straw and a layer of earth on the top. The potatoes are usually given time to sweat before covering with earth. Some people believe that potatoes mixed with earth keep better than clean ones. When required for the market, the end of the pit is opened and the potatoes are shovelled out.

Potatoes stored in pits, say, from November to March-April, show a loss of 15 to 20 per cent in weight. There is considerable variation in the technique of pitting and avoidable losses due to inefficiency are not infrequent. It is estimated that the loss usually varies from 10 to 30 per cent.

If potatoes have to be held till June, they are dressed in March and put back in pits. This makes them keep better and diminishes the loss due to growth, etc. If this dressing is not done in time, it is almost impossible to dress them out of the tangled growth of sprouts later.

Sometimes potatoes are also stored in warehouses but this is done for very short periods only, as the warehouses are primarily meant for facilitating the flow of the produce to the retail market and not for storage purposes.

Potatoes are not generally stored in cold stores because the cost of storage is high considering the selling price of the produce. Moreover, the cold storage plants are not always ideally located from the point of view of distribution of potatoes.

### (2) UNITED STATES OF AMERICA.

In the United States of America, potatoes are generally stored on the farms in semi-permanent dug-outs constructed of timber with straw and soil covering, sod walled stores or storehouses proper. The last type of store varies from semi-sunken wooden sheds with insulated roofs and additional protection against heavy weather to the elaborate wooden structures often with concrete foundations known as the "Main" type of potato warehouses.

The practice of storing potatoes in warehouses is also in wide use. This is done not because storage on the farm by pitting or otherwise is more expensive but in order to meet climatic and distributive conditions. Besides this, both merchants and growers' agencies own large number of potato stores at local shipping points where consignments are collected, graded and loaded. Cold stores are not generally used as the temperatures are already sufficiently low in the North. Their use is mainly confined to the southern parts for holding northern grown seed for planting in the next season. To a very small extent potatoes for table purposes are also kept in cold store in the distributing centres.

### (3) ITALY.

In Italy, the seed tubers are stored in sheds called "Peglia" constructed of lupin straw near the farm houses, or in the fields. These are usually ten feet long, six feet broad and eight feet high. At times the tubers are stored in pits dug in the fields. The dimensions of the pit vary according to the quantity of the tubers to be stored. They are usually five to six feet long, four feet broad and two feet deep. The pit is lined with straw before the tubers are put in. The upper part is also covered with straw and earth. The "Peglia" system is considered to be better than the pit system as it is said to give better protection to tubers against cold and rain in winter. The tubers thus preserved usually remain in good condition till the planting time. The storing of seed

potatoes is not a serious problem in Italy. The storage rots caused by such organisms such as *Fusarium*, *Bacteria* and *Phytophthora* are not of common occurrence owing to the cold climate during the storage period. The mean temperature from July onwards when the potato harvest begins is not above 75°F. and from November onwards it falls considerably. It is only in exceptionally warm years that there is some damage to the tubers by these rots.

In cold countries such as England, Italy and Germany, the problem of storage is mainly the protection of potatoes from frost. This is why cold storage methods are not generally used in these countries. The problem in India is, however, altogether different. The growers and merchants here suffer from a natural handicap. India, owing to its situation in the tropical zone, has a fairly high temperature all the year round and consequently the annual wastage due to rot and shrinkage is considerable. Then again, the difference in prices of potatoes at the harvest time and at the off-season is considerably higher. In the months of July, August and September, the price of potatoes goes up by almost 100 per cent. If, therefore, advantage is to be taken of such price fluctuations and if the fluctuations themselves are to be reduced to reasonable limits it is essential that proper methods of storage should be adopted.

#### F.—Seasonal variations in stocks.

India has a large population and requires enormous quantities of potatoes to meet the demands of the consumers. As, however, the quantity produced in the country is not sufficient for the demand, large quantities have to be imported from Italy, Kenya Colony and Burma.

Potatoes for table purposes are stored for about a couple of months and, in a very few cases, for more than 4 months after harvest. They generally do not keep well in the rainy season. The stocks from the main crop all over the plains are, therefore, exhausted by July. The wholesalers and retailers do not maintain any stocks in the proper sense of the term. They depend on the primary producers for their supply and their short period stocks are determined by the day to day demand of the market. The question of stocks in the case of potatoes for table purposes does not, therefore, arise.

Potatoes for seed purposes are stored for five to seven months in certain areas and the estimated quantities stocked annually in different provinces and States are given in the following table :—

*Estimated stocks of seed potatoes in the different potato producing provinces and States.*

Province/State.	Stocks. (In maunds).
United Provinces . . . . .	2,713,400
Bihar . . . . .	3,506,300
Bengal. . . . .	500,000
Assam . . . . .	415,800
Madras . . . . .	345,000
Bombay . . . . .	233,000
North-West Frontier Province . . . . .	68,800
Punjab . . . . .	62,500
Sind . . . . .	1,000
Central Provinces and Berar . . . . .	1,700
Mysore State . . . . .	63,100
Kashmir State . . . . .	21,000
Other States and Provinces . . . . .	600
Total . . . . .	7,932,200
Burma . . . . .	255,000

From the above figures it is evident that large stocks of seed potatoes are maintained by the cultivators. These are carried over from the harvest season of one crop to the planting season of the next crop. Though the stocks maintained appear to be very large, they are not in fact sufficient for the seed requirements of the country. Large quantities of seed potatoes are imported annually from foreign countries into India.

So far as seasonal variation is concerned, it has been found that stocks are the largest in the harvest season which extends roughly from January to April in the plains. During this period the market is also flooded. With the harvest season nearing its end, the volume of stocks goes on decreasing till it reaches the lowest ebb in June and July. The supplies to the market fall off accordingly and prices go up in accordance with the law of supply and demand. The few far-sighted cultivators who manage to preserve the produce till that time realize a good price. In the consuming centres the peak season is from February to May when the supply is abundant. The season of hill potatoes usually starts from July and continues till November. Generally, they are not stored for long as by about December the early crop of the plains starts coming into the market.

Generally, stocks are the largest in the harvest season but with the passing of the season they gradually fall off till they are at their lowest in June, July and August. They gradually increase again and the quantities available in October are comparatively larger. In November, the stocks decrease again but from December, with the arrival of the new crop in certain areas in the plains, the stocks begin to increase again.

#### **G.—Periodicity and extent of market gluts—their causes and control.**

It has been mentioned before that the supply of potatoes is the highest at the time of harvest, *i.e.*, from January to April when the main crop of potatoes in the plains is being harvested. During this period large stocks of potatoes arrive in the market and this abundance of supply is sometimes described as a glut. But there is really no glut in the proper sense of the term. Though the supply is abundant, the demand for the commodity is also high. Further, potato is not a very perishable commodity and its supply can be withheld for a time from the market if any chance of glut appears. The whole stock is not, therefore, released to the market all at once. The supply at many places, however, is greater than the local demand and the price of the commodity naturally falls off.

Potatoes fetch a low price in the harvest season, and the producer would be well advised to store a part of his produce till a later date and to release it to the market gradually. Under the existing conditions, however, it is not always possible for him to do so. He does not have sufficient funds to finance his own business and has, therefore, to depend on the money-lenders and commission agents. Apart from the rent which he has to pay to the landlord, he has to meet many other financial liabilities. He has, therefore, to send his produce immediately after harvest to the market so that he may be in a position to meet his liabilities in time. This results in an abundance of supply and a consequent fall in the price.

Another reason which has been advanced as an explanation for the abundance of supply in the harvest season is the ignorance of proper methods of storage, and the lack of storage space. If proper storage facilities were provided in the country, the cultivators would make the best use of them and the market would not be over-flooded in the harvest season. These storage facilities would help to spread out the produce more evenly throughout the year and thus the excessive supply at the harvest season would be checked. A widespread use of cold storage facilities in the country seems to be the only solution for the regulation of supplies.

## INTER-CHAPTER SEVEN.

The problem of providing proper and adequate storage facilities is particularly important in the case of a commodity of a semi-perishable nature like potato. Although the seasons of harvesting in different parts of India overlap to some extent, there remain considerable gaps and it is, therefore, necessary to store potatoes to meet the demand in the off-season.

In order that growers or merchants may feel inclined to store a commodity, it is necessary that the ultimate selling price should equal the selling price at the harvest time *plus* a premium to cover losses in storage, interest on capital employed and cost of labour and material involved in storage.

The seasonal rise in the price of potatoes is a well-known tendency. During February and March, they sell at Rs. 1-8 to Rs. 2-8 per maund, but from July to November, prices go up and are nearly double of what they are in the previous period. The rise in the price of seed potatoes is even higher. At the time of harvest their prices range from Rs. 1-8 to Rs. 2-8 per maund, but after about six months, prices go up in most of the markets, particularly in the United Provinces, Bengal, Bihar and the Punjab, to Rs. 5 to Rs. 14 per maund. In spite of such high prices, however, those who store potatoes do not make much profit as more than 50 per cent of the potatoes are generally lost during storage. If this loss could be reduced, prices would not rise so steeply, producers would obtain seed at a cheaper rate and cost of production generally would be reduced.

In most of the important consuming markets like Bombay, Calcutta and Madras, merchants try to dispose of the potatoes immediately on arrival and seldom hold stocks even for a week. It is only in producing areas that potatoes are stored mostly by producers and to a very small extent by local merchants.

In the plains, the produce of the winter crop is generally stored as it keeps better. The methods of storage practised in different parts of the country vary considerably and cannot be conveniently grouped under suitable heads. In Bihar, table potatoes are not usually stored for any length of time. For seed purposes, however, potatoes are stored in large quantities for a period of five to six months in the hot and rainy weather (March to October). They are stored in

sand where they keep better and are also protected to some extent from the potato moth (*Phthorimea operculella*), the pest which proves most fatal during the storage period. The godowns used for storage are built on a higher plinth and are usually surrounded by other buildings to keep them dry and cool. Before storing, potatoes are kept in the open for some time so that the surface moisture may dry up. During this period, sorting is carried out and diseased and damaged tubers are removed. Potatoes are stored 9" to 12" deep between two layers of sand, each 1" thick. Care is taken to cover all tubers, otherwise they are liable to be attacked by the potato moth. A week after storing, the tubers are examined to test the temperature. If it is found that heat has developed, the potatoes are taken out and left in the open for a couple of days. After removing the damaged ones, they are again covered with sand. If, however, the temperature in the heap is normal, it is opened after about a fortnight for picking out the damaged tubers. In the monsoon season, however, potatoes are taken out more frequently for sorting out bad ones and for breaking off the sprouts, if any. After the monsoons, only the sound tubers are preserved in baskets arranged on a *machan* (platform made of bamboo). While in baskets, potatoes are examined now and then for picking out the bad tubers and breaking off the sprouts. Some people keep the potatoes in sand even during the monsoons.

Great skill is required in storing potatoes. One must know when to open a heap, how long to keep the potatoes in the open and how long to keep them in baskets. The percentage of damage during storage may, therefore, vary considerably among different merchants in the same village.

In the United Provinces, large quantities of potatoes are stored for seed purposes in the districts of Farrukhabad, Jaunpore and Meerut. The method of storage is more or less the same as followed in Bihar, and the losses in storage are usually very high. In the hills, potatoes are stored for seed purposes by burying them in pits dug out for the purpose. Most of the growers, however, preserve them in ordinary godowns. As the losses in storage have been high, a cold store was opened in Meerut in 1938, in which seed potatoes are now stored.

The methods of storage in Bombay differ considerably from place to place. Generally, potatoes are stored in 18" deep and  $2\frac{1}{2}$  to 3 feet wide pits dug out in the fields. The length of the pit depends on the volume of the produce to be stored. The pit is filled with water which is allowed to soak for five days. When



it is dry, neem leaves (*Azadirachta indica*) are spread at the bottom and the sides to avoid the tubers coming into direct contact with the soil. Selected tubers which have been previously dried are heaped in the pit, usually up to a height of 3 to 3½ feet, and are covered with a thick layer of grass or *kadbi* (*jawar* stalks). A ditch is then dug round the heap at a distance of one or two feet and is occasionally filled with water. Sometimes, when it is very hot, water is sprinkled on the top of the heap to bring down the temperature. As far as possible, the heap is not disturbed until the potatoes are finally taken out for sale. The potatoes are inspected by opening the top covering and picking up a few tubers by hand. If the potatoes are found to have been attacked by moth (*Phthorimea operculella*), cultivators try to sell their stock as quickly as possible.

To check the attack of the moth, which is very common, some cultivators fumigate their produce with petrol, particularly if it is to be stored for seed purpose. In a number of villages, permanent fumigation chambers have been established and are in charge of village committees. They are built of brick and are lined with cement plaster to make them airtight. They are cylindrical in shape with an internal diameter of seven feet and a depth of six feet and have a capacity of 2½ tons of potatoes packed in bags. To get rid of the moth completely, a second fumigation is necessary after about ten days by which time the eggs are hatched out.

In the Poona district, a large part of the winter crop is stored and stocks are gradually released for the market from July onwards. The produce of the summer crop which is rain-fed is not generally stored as it does not keep well.

In the Central Provinces, rather small quantities of potatoes are stored for seed or table purposes on account of greater liability to attack of potato moth. After harvest, sound tubers are selected for seed purposes, and are dried in a low structure roofed with branches and leaves to protect them from the direct rays of the sun. They are then spread about one foot thick on the floor of a room which may be either *kachcha* or *pucca*. The storing room is kept closed and opened only once a fortnight for removing the rotten tubers. Better class cultivators in Saugor and Murwara store their seed in thin layers over rough bamboo platforms constructed in their house or cattle sheds. Tubers are laid about 6 inches deep and sometimes covered with bamboo matting.



The Department of Agriculture in the Central Provinces has recently introduced an improved method of storage which is being gradually adopted by growers. In principle, this method is the same as that followed in Poona. The main difference in the two methods is that pits in the Central Provinces are dug 24 to 30 inches deep, while in Poona they are only 18 inches deep. Moreover, potatoes in Poona are heaped to a height of  $2\frac{1}{2}$  to 3 feet while in the Central Provinces they are heaped up to 6 inches below the neck of the pit. Another important difference is that in the Central Provinces bamboo shaft chimneys are used for ventilation. Potatoes kept in pits sweat due to the processes of transpiration and respiration, and the moisture thus accumulated causes rotting. To avoid sweating and to have free aeration in the pit, pieces of hollow bamboo shafts with the septa at the nodes removed and having holes in the side are used to serve as chimneys or ventilators. The chief merit of this method consists in the provision of the bamboo chimney which considerably reduces the temperature during the hot months by allowing proper ventilation in the pits. This method should be tried in other provinces and States where potatoes are stored for seed purposes and losses are generally heavy.

The cost of storage is important as it influences the decision of growers and merchants whether or not to store the produce from season to season. The estimated cost of storing 500 maunds of potatoes in Bengal for the season (3 months) is about Rs. 50, *i.e.*, the cost per maund per month varies from 6 to 7 pies only. In the Central Provinces, where the pitting processes are somewhat laborious and pits are dug deeper, the cost per maund per month works out at about one anna. It would thus appear that the cost of storing potatoes varies from 6 pies to 1 anna per maund per month. This amount is practically negligible when compared with the rise in prices as the season advances. But as losses during storage are heavy, the cost of storage increases.

It is difficult to assess the exact amount of loss in storage as it depends on a number of factors, the most important being temperature, humidity, freedom from earth and moisture, aeration and exclusion from light. About  $36^{\circ}\text{F}$ . is a suitable temperature for storing, but in most of the potato producing areas the maximum temperature during summer, *i.e.*, May to October, is very much higher. The losses are, therefore, enormous and cultivators have to take special pains to carry over

the stock of seed potatoes from one season to another. In certain cases, it is almost impossible to preserve the seed potatoes of one season till the next.

The percentage of loss increases with the temperature. After 5 months' storage the loss at 60°F. is 11.56 per cent, and would be greater still at a higher temperature. Unfortunately, there are no data to show the exact decrease in weight at the higher temperatures at which the potatoes are normally stored in India.

Proper humidity is also of great importance. Cooper suggests that a humidity of 85 to 90 per cent is suitable when the temperature ranges from 30 to 35°F. But under the existing conditions of storage it is not possible to control humidity. During the early part of storing, *i.e.*, March to July, humidity in all the centres where potatoes are stored is below 80 with the result that potatoes shrink enormously.

Damage resulting from insufficient aeration is caused by lack of oxygen. In order to ensure an ample supply of pure air in the storage house, adequate provision should be made for ventilation.

Seed potatoes are not injured by light. In fact, European growers purposely expose their seed stock to light as this hardens the skin.

One of the important causes of rotting is the storage of unsound tubers which may be either mechanically injured or diseased. Very often germs of diseases and insect pests inhabiting the store room start their work of destruction immediately after the potatoes are brought into the store.

It is generally believed that losses due to decay and shrinkage from March to June, *i.e.*, after harvesting and up to the outbreak of monsoon, vary from 25 to 40 per cent. If potatoes are preserved till September-October, as in the case of seed potatoes in the United Provinces, Bihar and Bengal, losses are usually 50 to 65 per cent. In certain cases losses are as high as 60 to 80 per cent and sometimes the entire quantity stored is lost.

The annual loss in storage is heavy in India because scientific methods are not adopted. The annual losses in storage and in the process of marketing amount, at a very conservative estimate, to 8,553,100 maunds valued at Rs. 1,65,79,500.

In Bihar, where potatoes for seed purposes are stored in sand for six to seven months, losses due to rotting, etc., are very high. In Bengal, the loss in storing potatoes for table

purposes in about 3 months, *i.e.*, from March to June, is roughly 20 per cent. In the case of seed potatoes which are stored for about 6 to 7 months, the loss is usually about 40 to 50 per cent. At the Rangamati Agricultural Farm in Bengal, small quantities of seed potatoes of two varieties were kept in 1935-36 in a well-ventilated thatched hut on a *machan* and were covered with dry sand, but in spite of the proper arrangements that had been made, the loss in the first case was 59 per cent and in the second 64 per cent.

In the Poona district of the Bombay Presidency, where potatoes are preserved in pits, the percentage of loss due to attack of moth and rotting varies enormously. If the pitting is not done carefully, the entire quantity of potatoes in the pit may be spoiled. The damage under normal conditions in about 4 months varies from 20 to 30 per cent. In the Ahmedabad district, where potatoes are stored for a couple of months after harvest in thatched sheds in the river bed and thereafter for a month under corrugated sheds, the loss in storing during the period April to July, is usually from 25 to 30 per cent.

In the Punjab, potatoes are generally stored in *kothas* for one or two months. The loss in the case of the winter crop during the two months' storage in February and March is 12·5 per cent and in the case of the summer crop during one month of storage about 20 per cent. The loss is greater in summer because of the higher temperature.

In the Central Provinces, where potatoes are stored in pits, the percentage of loss is considerably lower than in Poona, where similar methods of storage are followed. The average loss is at about 15 per cent which is only half or three-fourths of the loss at Poona, which is usually from 20 to 30 per cent. In view of this low percentage of losses in the Central Provinces, it would be advantageous if the improved methods of storage followed there were adopted in Poona and other places, where the pitting method is practised.

In the Central Provinces, experiments on storing seed potatoes during rains, *i.e.*, from June to September, in sand, saw-dust and ash were conducted at the Government Experimental Farm, Chhindwara, and Demonstration Plot, Tamia. The average percentage of loss on the basis of two years' experiments in these two places was lowest in the case of sand (24·47) and highest in the case of ash (29·5). In the case of saw-dust, the average percentage of loss was 26·1 per cent. It thus

appears that there is not much difference in the losses suffered in the three cases. Sand, which is easily available, is used practically all over India.

In Burma, the loss in storage of seed potatoes from the disease caused by *Bacterium solanacearum* and from damage caused by the caterpillar of the potato moth (*Phthorimea operculella*) during the latter part of the rainy season, during winter, and during the early part of summer is usually high. The percentage of loss has been found to vary from 26.69 to 71.43 per cent. In one case it was over 70 per cent and in several others over 50 per cent. Experiments have also shown differences in the keeping quality of different varieties. For example, in the case of *Ally*, the losses averaged 33 per cent, for the *King of potatoes* 50 per cent and for *King George* and *Up-to-date* the average loss was about 57 per cent.

It is thus evident that huge quantities of potatoes are wasted every year during storage. The problem of storage is rendered difficult by the fact that the main crop is followed by a long and hot summer. It is, therefore, necessary that proper arrangements should be made for storage under low temperature.

The possibilities of utilising cold storage facilities for potatoes have been discussed later, but the following hints on storage of potatoes may be of some use:—

- (a) Well-ripened tubers should be selected.
- (b) Before storing, the tubers should be dried and cleaned of dirt.
- (c) All diseased, bruised and cut tubers should be removed and only clean and sound tubers selected for storage.
- (d) The storage room should be situated in a dry and cold place, preferably under the shade of a tree or surrounded by other buildings. Underground cellars having a low temperature are well suited, provided they are not damp. The floor should be plastered or cemented, and should be absolutely dry. The room should be well ventilated and all doors and ventilators should have wire gauze of fine mesh to prevent entry of potato moths, etc. There should be no holes on the walls where insects might take shelter.

- (e) The store room should, if possible, be fumigated with sulphur fumes, and, while fumigating, all doors and ventilators should be closed.
- (f) The ventilators of the room should be opened every morning and evening but kept closed during the day.
- (g) Potatoes should be stored in dry sand as far as possible as it protects them from the attack of moth and keeps them cool. If they are not kept in dry sand, they should be fumigated with petrol.
- (h) Potatoes should not be piled in layers of more than 9 to 12 inches deep.
- (i) Potatoes should be inspected periodically and rotten and diseased tubers removed.

The main problem is to protect preserved potatoes from high temperature in the summer months. At present cold storage facilities exist at the port towns but they are not generally availed of, except in Karachi. There are several reasons for this apathy. Firstly, people have not yet realised the advantages of cold storage and few persons have seriously thought of utilising the cold stores for storing a cheap and semi-perishable commodity like potato. Secondly, the port towns where the cold stores are located are at long distances from the main producing centres, and the cost of transport to the cold store including the rent for storage has been rather high.

The importance of cold storage of potatoes is, however, being realised gradually, and in recent years cold stores have been erected in certain important potato producing centres like Meerut, Sialkot, Patna and Jammu. In Sind, where the main potato producing area is within a few miles of Karachi, growers have been freely utilising the available cold storage facilities both for table and seed potatoes. This has taken place in spite of the fact that the margin between the prices of potatoes at harvest time and of seed potatoes at the planting time has not been as great in this area as in the Punjab, United Provinces and Bihar. The differences in prices in Sind average Rs. 4 per maund whereas in other provinces the variations are as much as Rs. 7 to Rs. 10 per maund. The storing of potatoes in cold store on a commercial scale was started in Karachi as early as 1932.

Cold stores have been built at Meerut, Sialkot, Patna and Jammu exclusively for potatoes.

The problems of storing potatoes for seed and table purposes have to be considered separately.

It will be seen that the prices of potatoes in most of the markets are low from January to May and high from June to November, the difference in certain cases being as high as Rs. 2 per maund. Taking the cost of storage in cold store at 4 annas per maund per month, and the average period of storing at two months, the cost of storing *plus* other incidental charges including interest on capital would come to about 12 annas per maund. After meeting all expenses, therefore, there still remains a margin of more than a rupee per maund.

Potatoes kept at low temperature for a considerable period accumulate sugar and taste sweet when cooked. If, however, they are exposed to ordinary temperature for a week, most of the accumulated sugar changes into starch and they no longer taste sweet. Experiments may be conducted to see the effect of cold storage on the cooking quality of potatoes of different varieties when kept at various temperatures.

Potatoes for seed purposes have to be preserved for six to seven months and losses in this case are enormous under present conditions. There is, therefore, a vast difference in the prices of potatoes at harvest time and at planting time, ranging from Rs. 2 to Rs. 9-9-0 per maund. This vast difference in the prices clearly indicates the possibilities of using cold stores for seed potatoes even if storage charges are over 4 annas per maund per month.

Under the cold storage scheme at Poona which is financed by the Imperial Council of Agricultural Research, considerable research work has been done on the effect of storage temperature, on germinating capacity and the chemical changes that take place during storage. It has been found that freshly harvested potatoes can be preserved without sprouting for 3 or 4 months at 52°F., for 5 months at 45°F., for 7 months at 40°F. and for an almost indefinite period at 35°F. It was also observed that potatoes remained dormant for 7 months at 40°F. when stored soon after harvest, whereas those obtained from the same source but stored after exposure to ordinary temperature for 2 months began to sprout after 2 months.

Potatoes kept at a temperature of 30°F. to 32°F. suffer from internal breakdown and do not germinate if stored for three months or more. Immature tubers lose water rapidly, shrivel badly and are attacked by the fungus *Penicillium*. If, however, tubers are properly selected, the wastage due to rotting at

about 35°F. and 40°F. is almost nil. The loss in weight in storage during 9 months at 35°F. is about 10 per cent when potatoes are kept in open trays, and about 5 per cent if kept in gunny bags or crates at 40°F. The germinating power of potatoes is not affected by cold storage at 35°F. even for a year.

Cold storage charges vary from place to place. At Karachi there are two cold stores. For small lots these charge 6 annas per maund per month and for big lots 4 annas per maund per month. The Cold Store at Meerut charges Rs. 4 per 100 lb. for the entire season, *i.e.*, from April to the first week of October. The monthly charges thus amount to 8 annas per maund. At Sialkot, the charges are Rs. 4 per maund for the period, May to first week of October, the charges per month being Re. 0-12-3 per maund. In Jammu, the charges are made in kind. Half the quantity stored is taken as rent for the cold store. In spite of such high charges, it pays growers to keep their seed potatoes in the cold store, for if they are to make their own arrangements, the loss might be 50 per cent or even more in certain cases.

According to experiments and observations made by the commercial concerns, the loss in cold storage 5 to 6 months may be taken to be 2 to 6 per cent, which is very small when compared with losses sustained by other methods.

In cold countries such as England, Italy and Germany, the problem of storage is mainly the protection of potatoes from frost. That is why cold storage methods are not generally used in these countries. The problem in India is, however, altogether different. Growers and merchants here suffer from a natural handicap, *viz.*, the fairly high temperature all the year round. Then again, the difference in prices of potatoes at the harvest time and at the off-season is very high. In the months of July, August and September, the price of potatoes goes up by almost 100 per cent. If, therefore, such price fluctuations are to be turned to the advantage of growers and if the fluctuations themselves are to be reduced to reasonable limits, it is essential that proper methods of storage should be adopted.

Potatoes for table purposes are stored for about a couple of months and, only in a few cases, for more than 4 months after harvest. They do not generally keep well during the rainy season.

Large stocks of seed potatoes are also maintained by cultivators. These are carried over from the harvest season of one crop to the planting season of the next crop. Though the

stocks maintained are large, they are not sufficient for the seed requirements of the country. Large quantities of seed potatoes are imported annually from foreign countries into India.

As far as seasonal variations are concerned, it has been found that stocks are the largest during the harvesting season which extends roughly from January to April in the plains. During this period the market is also flooded with potatoes. With the harvesting season nearing its end, the volume of stocks goes on decreasing till it reaches the lowest point in June and July.

Potatoes fetch a very low price during the harvest season. Producers would, therefore, be well advised to store a part of their produce till a later date and release it to the market gradually. Under existing conditions, however, it is not always possible for the producer to do so. He does not have sufficient funds to finance his own produce and has to depend largely on money-lenders and commission agents. Apart from the rent which he has to pay to the landlord, he has to meet many other financial liabilities. He has, therefore, to send his produce immediately after harvest to the market. This results in an abundance of supply and a consequent fall in the price. A widespread use of cold storage facilities seems to be the only way of regulating supplies and prices.

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## CHAPTER VIII.—TRANSPORTATION.

### A.—Produce movement.

India produces large quantities of potatoes for home consumption but the production is not evenly distributed throughout the country, so that the produce has to be moved from one place to another. Bengal, the Central Provinces, Orissa and Bombay in particular are not self-sufficient and have to import large quantities annually. Other provinces and States also import potatoes in their off-seasons but not to the same extent as those mentioned above. The movement of potatoes in India is illustrated on the map facing page 145.

*United Provinces.*—The United Provinces produce by far the largest quantity of potatoes in India, the estimated annual production being 22,611,400 maunds. The chief centres of production are Farrukhabad, Karimganj, Kamalganj, Jaunpore, Moradabad, Hardoi, Hapur, Meerut, Sambhal and Kumaon Hills. Out of the total annual produce, about 710,000 maunds are exported annually to the Punjab, Delhi and Bengal and to some of the Indian States. 92 per cent of the exports are for consumption and the rest for seed purposes. In spite of their huge production, the United Provinces also import fairly large quantities, mainly from Bihar and the Punjab. The total imports are 440,000 maunds of which 91 per cent are for consumption and the remaining 9 per cent for seed purposes.

*Bihar.*—This province also produces large quantities of potatoes. The chief centres of production are Bihar Sharif, Patna, Saran, Darbhanga and Hazaribagh. The quantity annually produced is estimated at 9,451,000 maunds out of which 1,520,000 maunds are exported to outside places. The Bihar potatoes are in great demand for seed purposes, and are sent to the Punjab, Bengal and the United Provinces. The table potatoes move from growing centres to towns round about them. Bihar imports about 1,044,000 maunds of potatoes mostly from Simla, Darjeeling and Calcutta mainly for table purposes. Besides, about 60,000 maunds of potatoes are imported across the Nepal frontier and are mostly used as seed.

*Bengal.*—In Bengal, the chief producing centres are Kalna and Mamari in Burdwan district; Tarakeswar in Hooghly district; Kistopur, Mitapukar and Ranipukar in Rangpur district; Garbertha in Midnapore district; Rampal in Dacca district, Fulbari, and the tracts on either side of Korotowa in Bogra district. These places export large quantities of potatoes to other districts in the province and only small quantities amounting to about 190,000 maunds per annum to places outside the province. The approximate quantities distributed from some of the important centres are shown below :—

#### *Estimated quantities of potatoes exported from producing centres in Bengal.*

Name of the exporting centre.	Places of import.	Quantity.
Kalna and Mamari . . .	Calcutta, Ranaghat and Goalund . . .	(In maunds.) 2 to 3 lakhs.
Tarakeswar . . . . .	Calcutta . . . . .	3 to 4 lakhs.
Bogra . . . . .	Siliguri, Rajshahi and other places . . .	3 lakhs.
Garbertha . . . . .	Midnapore, Cuttack and other places . . .	1½ lakhs.
Rampal . . . . .	Dacca, Narayanganj, Bhairab Bazar, Chandpur and Barisal.	1 lakh.

Bengal is not self-sufficient in respect of potatoes, and has to import large quantities from Burma, Bihar, Assam, the United Provinces, Madras, the Punjab, Nepal and Sikkim amounting to about 1,900,000 maunds per annum.

*Assam.*—Potatoes are grown in almost all districts of Assam. The chief centres having surplus production are the Shillong sub-division and the Manipur State in the Khasi and Jaintia Hills. The annual production in the Khasi and Jaintia Hills amounts to a little over 625,000 maunds, out of which nearly 308,000 maunds are transported to Gauhati, and 29,000 maunds to Sylhet district. A fairly large proportion of the quantity sent to the former place is exported to other provinces such as Bengal, the United Provinces, Bihar, Orissa and the Central Provinces. A part of the quantity transported to Sylhet district is also sent to the adjoining districts of Bengal. The annual exports from Assam to other provinces amount to about 132,400 maunds.

The quantity of potatoes imported into the province is negligible. During the three years 1936-37 to 1938-39, the average annual imports amounted to 8,000 maunds only.

*Bombay.*—The chief producing centres in Bombay are Poona, Talegaon, Wathar, Koregaon, Belgaum, Dharwar and Boriavi, from where the potatoes are sent mainly to Bombay, Ahmedabad, Sholapur, Miraj, Sangli, Chik Ballapur, Devanahalli, Bangalore, Nagpur and Kolhapur. Bombay also imports large quantities of potatoes from foreign countries and from Madras, the United Provinces, Palanpur State, Mysore State, Baroda State, the Punjab and Bihar. Out of the total imports into the province, the Bombay city gets about 399,000 maunds. A part of the imports into the city is redistributed to other markets within and without the province. The annual exports of potatoes from the province are estimated at about 84,000 maunds out of which about 18 per cent are to foreign countries and the remainder to the adjoining provinces and States.

*Central Provinces.*—Chhindwara, Umreth, Tamia, Khamla, Saugor, Murwara, Jubbulpore and Paehmarhi are the chief centres of production in the Central Provinces. These places generally supply potatoes to the various markets in the province. As the local production which is estimated at 325,000 maunds is not sufficient to meet the home demand, large quantities, amounting to 156,500 maunds are imported annually from Simla, Nainital, Mettupalaiyam, Poona and Bombay. 70 per cent of the imports are received from the United Provinces (Nainital, Dehra Dun and Farrukhabad), Punjab (Simla, Kalka and Karnal) and Bihar (Patna), 20 per cent from Bombay (Poona and Nasik), and 10 per cent from Madras (Mettupalaiyam), Assam (Shillong) and Bengal.

*Madras.*—Madras produces large quantities of potatoes particularly in the Nilgiri Hills. Nilgiri potatoes are in demand both in the province and in a number of outside markets. The most important consuming centres in the presidency in order of importance are Madras, Trichinopoly, Madura, Salem, Katpadi, Tanjore, Karaikudi, Mangalore, Tinnevely and Erode. The quantity exported annually is estimated at 208,000 maunds, the chief places of export being Bombay, Calcutta, Secunderabad, Ernakulam, Nagpur, Colombo, Berhampore, Bangalore and Cuttaek. Besides direct exports from the producing area, small quantities amounting to 5,400 maunds in 1934, 1,538 maunds in 1935 and 8,200 maunds in 1936 were re-exported from Madras city to Calcutta. The imports into Madras Presidency are estimated at 175,000 maunds, half of which come from Burma. In some years, however, the imports from Burma are low depending mainly upon the supply of the local crop.

*Punjab.*—Karnal, Sialkot, Ludhiana, Jullundur and Ferozepore are the main producing districts in the plains of the Punjab and large quantities are exported to other places within and outside the province. Annual exports to outside provinces and States amount to 468,300 maunds. This includes both exports and re-exports which approximately amount to 123,000 and 345,300 maunds respectively. The produce is mainly despatched to Delhi, the North-West Frontier Province, Baluchistan, Bahawalpur, Patiala, Bikaner and other States in the Punjab. The movement of the produce from one district to another in the province is also considerable. The traffic (by rail alone) between the exporting stations mentioned above and the main consuming centres in 1934-35 and 1935-36, amounted to 57,674 and 73,617 maunds respectively.

Besides these producing centres, there are markets which are important from the point of view of distribution of hill potatoes. These are Simla, Kalka, Rawalpindi and Joginder Nagar (Mandi State). Large quantities of potatoes from the neighbouring British territories and hill States are sent to these places for being exported to the down country markets, mainly in Bengal, the United Provinces, Bihar, Delhi and the Central Provinces. These markets maintain the chain of supply throughout the year and are the main sources of supply of hill potatoes during the summer months when the local produce is not available in the plains. The markets within the province which import large quantities are Ambala, Lahore, Shahpur, Gujrat, Lyallpur, Jhelum, Multan, Rawalpindi, Ludhiana, Gurdaspur, Hoshiarpur and Gujranwala.

*Sind.*—The important areas of production are Malir, Bagirji, Khanpur and Piryalo. The estimated exports are about 75,000 maunds, of which Bombay takes 50,000 to 60,000 maunds, and the rest is shared amongst Ceylon, Iraq, Bahrein Island, Muskat Territory and certain Indian States in Kathiawar.

Sind imports a little less than one lakh maunds of potatoes, more than half of which come from foreign countries, mainly from Italy, and the remaining from Bombay, Farrukhabad, Quetta, Dessa and Simla.

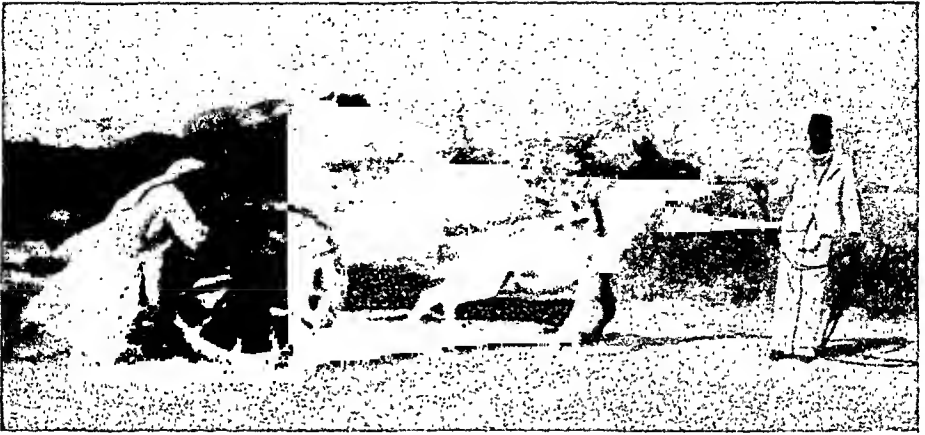
*Nizam's Dominions.*—The chief centres of production and consumption are the cities of Hyderabad and Secunderabad. As the production in these two cities is small, large quantities are imported from outside. Out of the total imports which amount to 46,000 to 54,000 maunds annually, Secunderabad accounts for 62 to 76 per cent. The imports are drawn mainly from Madras and Bombay Presidencies and the Mysore State.

*Baroda State.*—The chief producing centres for potatoes in the Baroda State are Chhani and Baroda talukas. About 60 per cent of the quantity produced in these centres is distributed within the State and the rest is exported. The inward movement is from Dessa in Palanpur State, Farrukhabad and Fatehgarh in the United Provinces and Bombay and Poona in the Bombay Presidency. About 85,000 maunds are imported annually from these places.

*Burma.*—Large quantities of potatoes are produced in Burma, the approximate annual production being about 1,740,000 maunds. The chief areas of production and distribution are Southern Shan States, Myitkyina, Bhamo and Mandalay. Of the total produce of Burma, about 849,000 maunds on the average are exported to India and the rest is consumed locally.

### B.—Transport.

Railways are the chief means of transport from the producing to the consuming centres, but in recent years, the use of motor lorry has greatly increased, particularly for transport up to 100—200 miles. The cost of



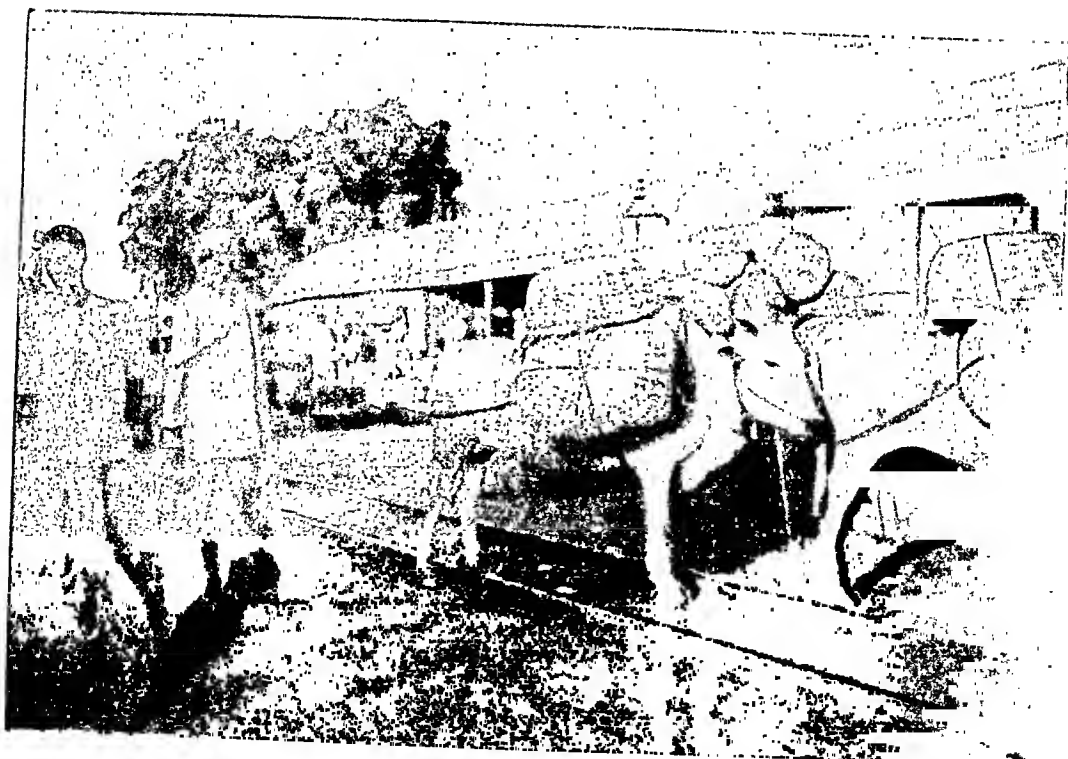
A PONY CART CARRYING BAGS OF POTATOES STUCK UP DUE TO BAD ROAD.



BAGS OF POTATOES CARRIED AS HEAD-LOAD, DHAMTUR.



BAGS OF POTATOES CARRIED ON BACK, ASSAM.



BULLOCKS LOADED WITH BASKETS OF SEED POTATOES.

transport is mainly responsible for the differences in prices of potatoes between the assembling and the consuming markets. In India, transport is effected by road, rail, inland water-ways and sea.

### (1) BY ROAD.

The road system of India is not in a satisfactory condition. The movement of the produce occupies an important place in the marketing organization of a commodity. In India, a huge network of roads is necessary to facilitate such movements from one part of the country to another. The arteries of roads which exist at present are insufficient for the requirements of the country. Further, most of them are unmetalled and become useless during the rainy season. The roads which connect the farms to the assembling centres are worse. (See plate facing page 170). Some of these *kachcha* roads are low and subject to complete inundation during the monsoon when they get utterly useless. In spite of this, however, transportation of potatoes by road is carried on to a considerable extent because it possesses certain advantages over transport by rail. Moreover, there are no railways in certain potato producing areas.

There are various means of road transport for potatoes, namely, (a) head-loads, (b) pack animals, (c) carts and (d) motor lorries.

(a) *Head-loads*.—The method of carrying loads on head is primitive and inconvenient but is still in vogue in certain parts of the country. For obvious reasons the distance covered by this method is generally small. (See plate facing page 170). In almost all the centres, a certain proportion of the produce is transported as head-loads, particularly from the fields to the main road or the assembling market if it happens to be within a short distance. In the Khasi and Jaintia Hills of Assam (see plate facing this page), Simla Hills of the Punjab and Kumaon Hills of the United Provinces, potatoes have to be transported by coolies for some distance as the hilly nature of the land does not allow the penetration of roads into the interior. The average cost of transport by this method roughly works out at one anna per maund per mile.

(b) *Pack animals*.—Transport of potatoes by pack animals such as mules, donkeys, camels and bullocks is in vogue in the United Provinces, the Punjab, the North-West Frontier Province, Sind, Bombay and Burma. But usually the distances covered are not very long. Mules are a common means of transport in the hilly tracts. The major portion of the produce of Kangra valley, Simla and Kumaon Hills is transported by mules from the farms to the markets. In some parts of the Kumaon hills even goats and sheep are sometimes used.

Donkeys are commonly used in Sialkot and Gujranwala districts in the Punjab, and Hazara district in the North-West Frontier Province. A donkey carries on an average  $1\frac{1}{2}$  to 2 maunds, and the cost per trip is about 4·5 pies per maund per mile.

Camels are used as means of transport in the Multan and Shahpur districts of the Punjab, Malir and Bihan tracts in Sind, and Ahmedabad in Bombay. A camel load consists of two to four bags weighing from 5 to 8 maunds. The cost of transport per maund per mile is roughly about six pies. In the Malir tract, it is a little more owing to the nearness of Karachi City where there is a great demand for means of transport.

Bullocks are used as pack animals for transporting potatoes from Kachin Hills in Burma to the assembling market, a distance of about 25 miles. They are also used for transporting seed potatoes in Bihar. (See plate facing this page). A bullock is loaded with two baskets weighing roughly 17 viss each

The cost of transport in Burma is roughly 12 annas per trip or 3·9 pies per maund per mile.

The transport of potatoes by pack animals is limited by the geographical conditions and the distance to be traversed. Camels in the desert of Sind and mules in the hills of the Punjab and the United Provinces are best suited for the purpose and hence they are largely used. As potatoes are a perishable commodity, their transportation by pack animals which move rather slowly is suitable for short distances only.

(c) *Carts*.—Carts are by far the commonest means of transport in India. They are usually two wheeled, sometimes four wheeled and are generally drawn by a pair of bullocks, or by a single bullock as in some parts of the Punjab and Delhi (see plate facing this page). Other draught animals are also employed. For example, buffaloes are used in the Punjab, camels in Delhi and its surrounding areas of the United Provinces and the Punjab and ponies in Assam. The carts ply both on metalled and unmetalled roads. In the latter case there is no competition from motor lorries.

The carrying capacity of a cart depends on the condition of the road and the strength of the draught animals. A double wheeled cart drawn by a pair of bullocks can carry from 12 to 20 maunds on an average. In the Punjab, where stronger draught animals are used, the average carrying capacity is between 20 and 30 maunds.

The cost of transport by carts varies from place to place depending upon local conditions. The usual charge is about 3 pies per maund per mile. In certain parts of the Central Provinces (from Chhindwara to Nagpur) it may be as low as one pie per maund per mile on account of a keen competition with motor lorries and the railways. In Sind, it is about 2 to 3 pies per maund per mile. For short distances, however, such as from a railway station to the local market, the charges are usually higher than for longer distances.

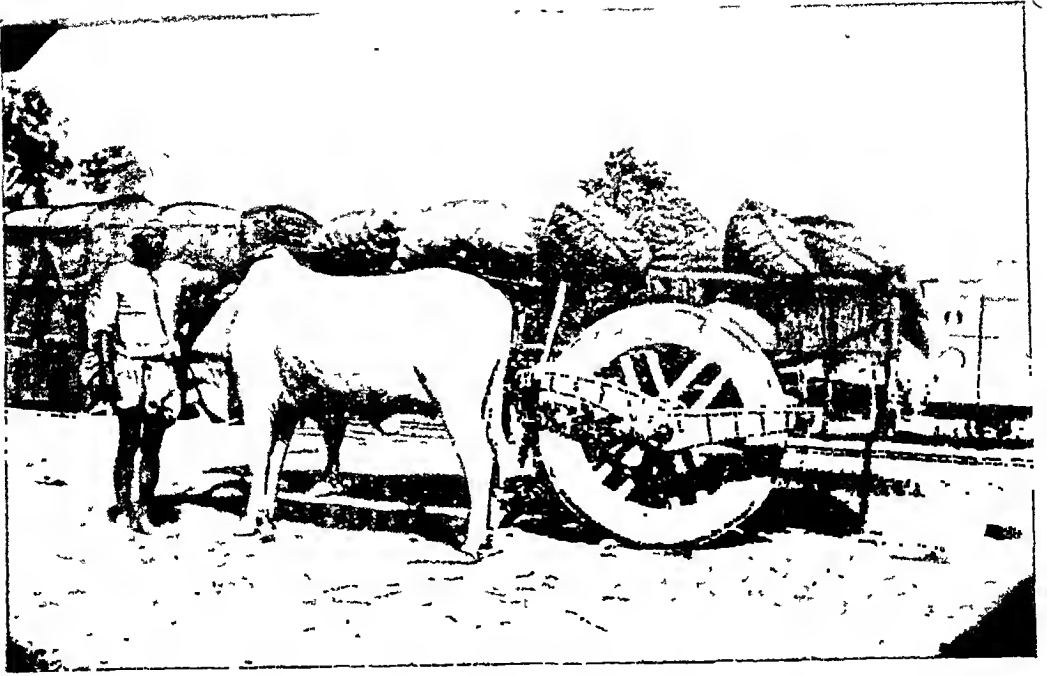
Carts are used throughout India for carrying the produce from the farms to local markets. They are also used for transporting the produce from the wholesaler's godown to the railway station and vice versa. They are very convenient for short distance transport, say of 20—40 miles. The services of a cartman can be used for loading and unloading and thus coolie charges are saved. Besides, they carry the goods from the senders' godowns to the receivers' godowns without any intermediate handling.

In Burma, carts are commonly used for the transport of potatoes from the brokers' godown to the railway station. In the Northern Shan States, the cart is the only means of transport from the villages to the rail head. The cart in this area carries four bags for which the hire is Rs. 1-4-0 for a distance of 8 miles.

In Southern Shan States carts used to be employed for carrying potatoes from producing areas to assembling centres but lately motor lorries are largely used and carts are now mainly employed for transporting the produce from the broker's godown to the railway stations. Each firm of potato dealers engages a team of carts with a "Hlegaung" as the head who may or may not own a cart. He acts as an intermediary between the cartmen and the agents of the firms, and also as a representative of the firms for obtaining railway receipts from the station after booking the goods. He gets a commission of  $\frac{1}{2}$  anna per cart per trip from the cartman for his services.

(d) *Motor lorries*.—Motor lorries have recently entered the field of transport in India. Although it will take a long time to oust the bullock carts



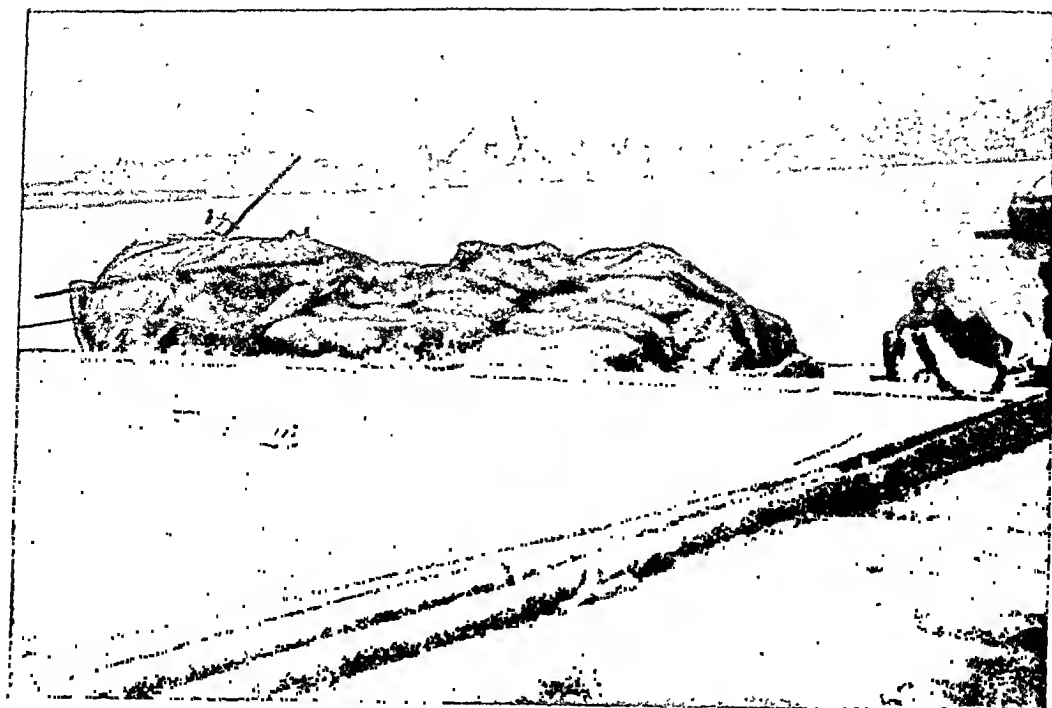


A BULLOCK CART CARRYING POTATOES.

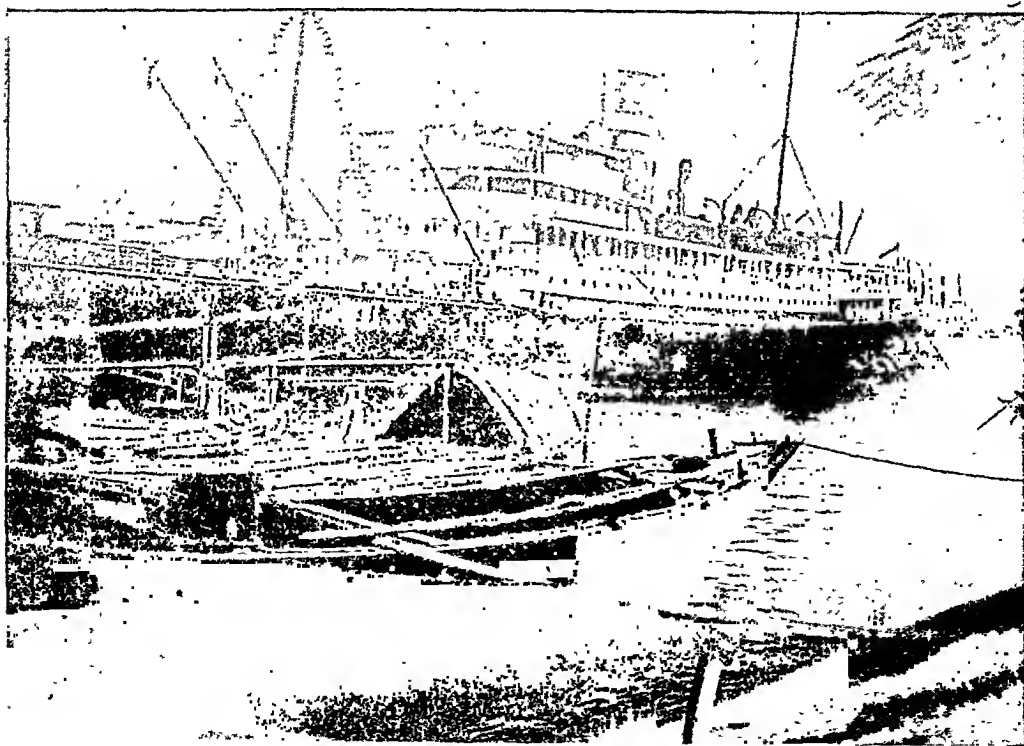


POTATOES BEING UNLOADED FROM A MOTOR LORRY.





POTATOES ARRIVING IN BOATS AT OUTRAM GHAT (CALCUTTA).



STEAMER CARRYING RANGOON POTATOES TO OUTRAM GHAT (CALCUTTA) AND BOATS BEING LOADED WITH POTATOES FOR ALUPOSTA (WHOLESALE MARKET), CALCUTTA.

from the countryside, the lorries have already become a serious rival to the railways. In almost all the provinces, motor lorries are being used for the transport of potatoes from one place to another. The main advantages claimed in their use are the cheap transport and speedy delivery.

The rates of charges vary with the distance to be covered, the condition of the road, the number of lorries available and the possibilities of return loads. The quantity of potatoes carried by a lorry varies according to its capacity, the average being 50 maunds.

Motor lorries are being extensively used for the transport of potatoes in the Punjab, Bombay, the Central Provinces, Madras and Burma. The lorries ply not only between the farms and the wholesale depots and from the latter places to the railway stations, but also between far off markets, especially in the Punjab and the Central Provinces.

In the Punjab, roads are comparatively better and motor lorries play an important part in the internal distribution of potatoes. Owing to low freights and the elimination of cartage and handling charges, etc., to and from the railway station, the transport by lorries is preferred by the dealers. Large quantities are moved daily from one market to another in the province and sometimes even to markets outside the province. From Ludhiana, for example, potatoes are transported to such distant markets as Delhi and Agra. The movement of potatoes by motor lorries from Joginder Nagar (Mandi State) to Amritsar and Lahore Markets is quite common. Large quantities from Sialkot, Ludhiana, Jullundur and Karnal are transported by lorries to the markets in the province and outside. An estimate of the quantities of potatoes exported by lorry from the above mentioned towns during the year 1935-36 is given below. For the sake of comparison, the quantities exported from these places by rail are also given :—

*Quantities transported by rail and motor lorries from some of the stations in the Punjab.*

Exporting centres.	By lorry (estimates).		By rail.		Total.
	To local markets.	To outside markets.	To local markets.	To outside markets.	
	(Maunds.)	(Maunds.)	(Maunds.)	(Maunds.)	(Maunds.)
Sialkot . . . . .	12,200	..	34,413	14,141	60,754
Ludhiana . . . . .	8,400	6,200	12,555	25,953	53,108
Karnal . . . . .	16,800	4,600	17,208	16,955	55,663
Jullundur . . . . .	21,600	..	10,202	8,913	40,715
Total . . . . .	59,000	10,800	74,478	65,962	210,240

From the above figures it will be evident that about 66·80 per cent of the total quantity was carried by rail and about 33·20 per cent by road in private lorries. The quantity transported by road to the provincial places formed about 44·21 per cent of the total traffic against 55·79 per cent by rail. 85·93 per cent of the inter-provincial trade is carried by rail and only 14·07 per cent by road. This is due to longer distances.

In the Central Provinces, the transport of potatoes by motor lorries in those parts where road communications are good has increased considerably as will be seen from the progressive decline in the export figures by rail from Chhindwara station to Nagpur.

*Quantities of potatoes exported from Chhindwara to Nagpur by rail.*

Year.	Quantity exported. (Maunds.)
1931 . . . . .	24,132
1932 . . . . .	19,113
1933 . . . . .	18,568
1934 . . . . .	9,659
1935 . . . . .	8,625
1936 . . . . .	266
1937 . . . . .	119

Chhindwara, an important potato producing centre, is situated at a distance of 80 miles from Nagpur and is connected with the latter both by rail and *pucca* road. Of the total potato supplies received in Nagpur from Chhindwara in recent years, roughly 99 per cent were carried by motor lorries and only 1 per cent by rail.

Assam exports annually large quantities of potatoes to Bengal. The main assembling and distributing centre for potatoes in Assam is Shillong which is not connected by rail. Potatoes have, therefore, to be transported by road up to the rail head. Potatoes are exported from the province, either via Sylhet or via Gauhati. In the former case there is no restriction on transport, but in the latter the right of transporting goods along Shillong-Gauhati road is leased out to private concerns by the Government of Assam every ten years. At present, the lease is with the Commercial Carrying Company which enjoys the sole right of transporting goods along this road. The Government have fixed a schedule of charges for different commodities. Recently the Government have allowed nine additional goods trucks on this road and the owners are required to pay to the Government Rs. 4,500 per truck per annum. The freights charged by them are according to the schedule laid down by the Government. The freight charge for potatoes from Shillong to Gauhati according to the schedule is Rs. 1-8-0 per maund, but this rate is very seldom charged as the margin between the ruling prices of potatoes in Shillong and Calcutta markets is too narrow. The freight charge is, therefore, subject to daily fluctuations depending on the variations in prices of potatoes at Shillong and Calcutta.

For fixing up the freight, the Manager of the Carrying Company and the leading exporters meet every morning and decide among themselves the freight to be charged taking into consideration the prices at Shillong and Calcutta. The rate is fixed in such a way that the exporters get a profit ranging from 2 annas to 4 annas per maund, after meeting all the expenses connected with transport and marketing. If the price at Calcutta goes up, the Carrying Company increases its charge and thus gets all the benefit from the rise in price, leaving the growers and exporters unaffected. On the average the freight charged from Shillong to Gauhati, a distance of 64

miles works out at 12 annas per maund or 2·3 pies per maund per mile. Sometimes, as pointed out above, the freight may be as high as Rs. 1-8-0 per maund. Against this, the transport charge in the hilly tract of Nilgiris, *i.e.*, from Ootacamund to Mettupalaiyam is 2·1 pies per maund per mile. It must also be noted that a good portion of journey in the former case is through flat country while in the latter case almost the entire journey is through steep hills. If the merchants and the growers in Assam are to get the benefit of the rising market, the monopoly of the transport company should be abolished and rival transport agencies allowed into the field. Alternatively a lower fixed rate should be charged which would be more in line with rates elsewhere.

In Madras, the transport of potatoes by lorries is very common. Potatoes from Ootacamund and Coonoor to Mettupalaiyam (see plate facing page 172), from Ootacamund to Mysore and Calicut and from Mettupalaiyam to markets in the Coimbatore and Trichinopoly districts are carried by motor lorry. The rate from Ootacamund to Mettupalaiyam, a distance of 32 miles, is Rs. 20 per truck load of 55 to 60 maunds and from Coonoor to Mettupalaiyam, a distance of 21 miles the rate charged per truck load is Rs. 12. According to the above figures, the transport charges by motor lorries work out at 2·1 and 1·8 pies per maund per mile respectively.

In Bombay Presidency, the motor lorries are now being increasingly utilised for the transport of potatoes and may ultimately oust bullock carts, at least from the good roads. In addition to this, some of the long distance traffic in potatoes is also being undertaken by motor lorries, such as from Poona to Kolhapur and Bombay, Khed and Manchar to Bombay, Belgaum to Dharwar and Kolhapur and from Bombay to Poona district. It is estimated that in 1935, nearly 61,000 maunds of potatoes were transported by motor lorries from Poona district, chiefly to Bombay city and to a small extent to Kolhapur and Belgaum.

In the Southern Shan States of Burma, potatoes are carried from the farms to the assembling centres by motor lorries, which are run at competitive rates. An idea of the motor transport rates may be obtained from the following examples :—

	Rate per 100 viss.			Rate per maund per mile in pies.
	Rs.	A.	P.	
Pindaya to Aungban, 24 miles . . . .	1	0	0	1·7
Pwela to Aungban, 18 miles . . . .	0	12	0	1·7
Pinlaung to Aungban, 46 miles . . . .	2	0	0	1·8

From the above account, it is clear that motor lorries play an important part in the transport of potatoes, specially within distances of 100 to 200 miles. They have the following advantages over the railways: (i) the produce is taken from the producers' holding or market and is delivered directly at the destination; (ii) incidental expenses at the consigning and receiving stations are avoided; (iii) the dealer who wishes to attend sales in person can travel free when he engages a whole lorry; (iv) the potatoes need not be packed in bags, (this results in a good deal of saving); and (v) damage due to handling at despatching, transshipment and receiving stations is considerably reduced.

In the case of short-distance transport it is, in several cases, cheaper to employ lorries as may be seen from the following example :—

*Comparison of the costs of transport of potatoes from Manchar to Bombay by rail and road.*

(Cost per bag.)

By rail. (Time taken, 3 days.)		By road. (Time taken, 12 hours.)	
	Rs. A. P.		Rs. A. P.
1. Lorry hire from Manchar to Talegaon by road.	0 8 0	1. Lorry hire from Manchar to Bombay.	1 4 0
2. Freight from Talegaon to Bombay by rail.	0 13 0	2. Hamali at Bombay . . .	0 0 6
3. Haulage from Wadi Bunder railway station to market.	0 1 6		
Total . . .	1 6 6	Total . . .	1 4 6

The above figures show that there is a saving of 2 annas per bag when goods are transported by motor lorries. It is also alleged that in the case of transport by rail 3 per cent of the produce is damaged.

## (2) BY RAIL.

The railways remain the largest means for carrying potatoes from one place to another both for short and long hauls. But for the railways, the long-distance transport of a perishable commodity like potatoes would have been very difficult. The road competition in recent years has become a serious problem for the railways but if a far sighted and liberal policy is followed, as some of the railways in India have begun to adopt, the difficulty would not prove insurmountable.

Potatoes are generally transported by goods trains though small quantities are sometimes taken by passenger trains also. The latter practice is, however, very rare, and takes place only between places where reduced rates apply. For example, considerable quantities of potatoes are carried by passenger and parcel trains on the North Western Railway, where liberal concessional rates have been introduced, such as from Rawalpindi and Ferozepore to certain stations as shown below :—

From.	To.	Reduced rate.
Rawalpindi . . . . .	Gujranwala town . . . . .	} $\frac{1}{2}$ parcel rate.
	Gujrat . . . . .	
	Lahore . . . . .	
	Nowshera . . . . .	
	Peshawar city and cantonment . . . . .	
	Sialkot . . . . .	
Do. . . . .	Amritsar . . . . .	} $\frac{1}{4}$ " "
	Ferozepur cantonment and city . . . . .	
	Kasur . . . . .	
	Kohat cantonment . . . . .	

Considerable traffic by passenger and parcel trains also takes place from certain stations in the North-West Frontier Province, Delhi and Jammu Tawi to the chief consuming centres in the Punjab. Haripur, Havelian, Peshawar city and cantonment are the main exporting stations in the North-West Frontier Province from where reduced rates are quoted. The quantity booked from these stations to markets in the Punjab amounted to 12,824 maunds in 1935-36. There is no provision in the Indian railways for cold storage vans for the transportation of potatoes. This is not very necessary either but what is wanted is that potatoes should be transported in insulated vans. The existing steel wagons are not properly ventilated and get heated in transit with the result that the potatoes are sometimes severely damaged. In the summer season, shrinkage and rotting of potatoes during transportation in such wagons is quite high, amounting sometimes to 25 per cent. Most of the railways have provided wooden vans for the transport of delicate fruits. It is desirable that the same arrangement should be made for the transport of potatoes, specially during summer.

The provision of additional facilities for storing and marketing potatoes at the terminal stations as is done in England would be a great convenience to the trade and probably lead to increased traffic being carried by rail.

(a) *Freight charges*—(i) *By passenger and parcel trains*.—The general rate for potatoes by passenger and parcel trains is half the parcel rate. This rate is very high and potatoes are, therefore, rarely booked at this rate. In order to encourage the traffic of potatoes by parcel and passenger trains, the North Western Railway authorities have quoted special reduced rates for small consignments from a number of stations. The booking is done at the owner's risk (see Appendix XXX) and the consignor has to pay the freight at the time of booking. The charges are made on the Zone System, and apply on the through distance in booking from one railway to another. The basis of rate decreases as the distance increases.

The railways also allow a concession in freight on seed potatoes booked by passenger trains. The rate charged is  $\frac{1}{4}$  parcel rate. It is, however, necessary for the consignor to produce a certificate from a gazetted officer of the Department of Agriculture to the effect that the potatoes are intended for seed purposes and not for trade. This concession is not, however, availed of, except when the quantity is small and has to be transported quickly, as, in spite of the reduced rate, the transport of potatoes by passenger trains is not sufficiently cheap.

(ii) *By goods train*.—All the commodities booked by goods trains are grouped into 16 classes, and this classification is adopted by all the railways in India. This grouping is done for the purpose of arriving at the rate which should be charged when no station-to-station or schedule rate is quoted and also for fixing the maximum and minimum rate per maund per mile. All rates of whatever kind are charged within these limits subject to exceptions specially authorised by the Railway Board. The minimum weight accepted for transport is seven seers and the minimum weight and distance for which charges are made by goods trains are 20 seers and 10 miles respectively.

Schedule rates are quoted on a basis lower than the maximum of the class. They may be on a uniform basis or may vary according to distances on the telescopic (cumulative) principle.

Potatoes are placed in class 2 when booked at the owner's risk and in class 2-A when booked at the risk of the railway. The telescopic schedule rate

varies according to distance, the minimum weight per consignment to which the rate applies being usually 300 maunds on the broad gauge and 160 to 270 maunds on other gauges. The schedule rates vary according to distances, vide the rates charged by the North Western and South Indian Railways shown in the following table :—

*Schedule rates charged by the North Western and South Indian Railways for potatoes.*

(Per maund per mile.)

Distance.	N. W. R. rate.	Distance.	S. I. R. rate.
	(Pies.)		(Pies.)
For the first mile and up to 150 miles.	0·380	For the first 200 miles . . .	0·350
For the extra distance above 150 miles but not exceeding 250 miles to be added to the charge for 150 miles.	0·333	For the extra distance above 200 miles, but not exceeding 250 miles to be added to the charge for 150 miles.	0·250
For extra distance above 250 miles but not exceeding 500 miles to be added to the charge for 250 miles.	0·200	For extra distance over 250 but not exceeding 400 miles to be added to the charge for 250 miles.	0·125
For extra distance above 500 miles, but not exceeding 700 miles to be added to the charge for 500 miles.	0·130	For extra distance on 400 and above to be added to the charge for 400 miles.	0·115
For the extra distance above 700 miles to be added to the charge for 700 miles.	0·100		

In addition to the above, the following terminal charges are also to be paid :—

	Local booking. Pies per maund.	Through booking. Pies per maund.
North Western Railway . . . .	8	4
South Indian Railway . . . .	12	6

It will be seen from the above table that the rate per mile decreases with the increase in the distance. The underlying policy is to encourage long-distance transport which would not be possible if the freights were charged at a flat rate for all distances. When, however, goods are carried over more than one railway, the rates are not calculated on the through distance between the two stations but separately for the different railway lines. In the case of goods travelling on more than one railway line, therefore, the benefit of the telescopic scale of rates is comparatively small. In many cases, potatoes are transported over 1,000 to 1,500 miles. As potato is a comparatively cheap commodity, it seems desirable that still cheaper rates be introduced for very long distances.

The station-to-station rates are special concessional rates for the total distance between two specified stations. They are fixed on the principle of "what the traffic will bear" after taking into account the volume of traffic and the competition from other transport agencies. They may be quoted as between two stations on the same railway or between a station on one railway and a station on another. The railways have in several cases given station-to-station rates for developing traffic between certain producing and consuming

centres. It may, however, be pointed out that both in the case of schedule and station-to-station rates, the potatoes are booked at the owner's risk (O. R.) and the consignor is required to execute a risk note prior to the acceptance of the consignment by the railway. A specimen risk note is given in Appendix XXX.

(b) *Terms of booking, delivery, etc.*—When potatoes are booked by goods trains, the payment of freight in advance is not compulsory. The consignor may either pay all the charges at the despatching station or book the goods "to pay", in which case the consignee pays all the charges before he takes delivery of the goods. The second alternative is encouraging for the movement of potatoes, and in almost all cases they are booked in this way.

All the railways charge wharfage and demurrage both on the inward and outward traffic of potatoes. It is charged either on weight or on the capacity of the wagon depending on whether the freight is levied on the weight or on the vehicle. In the case of both outward and inward traffic wharfage is due after a period of grace which is usually 24 hours. The charge is usually 3 pies per maund per day. In calculating wharfage a part of a day is reckoned as full day and a fraction of a maund as a full maund. Demurrage is charged on wagon loads only and the ordinary free-period is 10 hours of day light (7 A.M. to 5 P.M.) from the time the wagon is ready for loading and unloading. The rate of demurrage is usually one anna per ton or part of a ton of the carrying capacity of the wagon per hour or part of an hour.

### (3) BY INLAND WATER-WAYS.

Owing to the development of roads and railways in the country, the movement of potatoes by river is not very common. The cheap cost of transport by boats is certainly alluring, but against this has to be balanced the loss of time involved in this process of transport. Transportation by boats is not suitable for a perishable commodity like potatoes. The primitive nature of the country crafts acts as an obstacle to potato traffic through inland water-ways particularly with the advent of swifter and more convenient means of transport.

It is only in the Punjab and Bengal that potatoes are transported in small quantities through rivers and canals. In the Punjab, small quantities estimated at about 3,000 maunds are usually transported from Rupar to Ludhiana by the Sirhind canal in country boats (*dongas*). The cost of transport works out to one pie per bag per mile. In Bengal, potatoes from Rampal are transported by boats (see plate facing page 173) to Mirkadim, Dacca, Bhairab Bazar, Chandpur, etc., and the cost of transport varies from 9 pies to one anna per maund per mile. Tolls are also realised when potatoes are carried by boats and they are known as *khutgari* or river dues. The rates vary from 8 annas to Rs. 1-8-0 per boat carrying from 100 to 200 maunds.

### (4) BY SEA.

(a) *Coastal trade.*—There is a considerable coastal traffic in potatoes by steamers and country boats. In the Bombay Presidency, the coastal towns such as Chiplun, Ratnagiri, Vengurla, Karwar, Kumpta, etc., receive large quantities of potatoes from Bombay and Karachi by sea. Bombay itself receives 20,000 maunds annually from Karachi by sea and also small quantities from the Madras Presidency.

Calcutta imports annually 6 to 10 lakh maunds of potatoes by sea from Burma. The steamer freight from Rangoon to Calcutta (Outram Ghat) is Re. 0-4-3 per maund. From there the potatoes are carried in boats to Jagannath Ghat. (See plate facing page 173).



During the monsoon most of the small ports are closed due to rough sea and the coastal trade in potatoes is reduced considerably. Moreover, when the sea is rough, the potatoes get damaged due to the heavy shaking of the boats. From Mettupalaiyam to Bombay via Cochin, the cost of transport by sea works out to about eight annas per bag less as compared with that by rail. The merchants actually imported some consignments by sea but the percentage of damage was found to be very high and now only small quantities are imported by sea.

Madras also exports and imports fairly large quantities of potatoes by coastal steamers. The steamer freights between Madras and some of the ports are as follows :—

	Freight per ton.		Freight per maund.	
	Rs.	A.	A.	P.
From Madras to Calcutta . . . . .	7	12	4	7
From Rangoon to Madras . . . . .	11	0	6	6
From Cochin to Bombay . . . . .	8	4	5	0

Besides freight, handling charges are also incurred in the process of transportation.

(b) *Imports from foreign countries.*—Potatoes for table and seed purposes are imported into India in large quantities from foreign countries—mainly Italy and Kenya Colony. The imports are largely received in Bombay and Karachi. India also exports potatoes, mainly to Ceylon and in small quantities to ports in the Persian Gulf. Details regarding quantities imported and exported by sea from and to different countries have already been given in Chapter on “Supply”. The potatoes are mainly carried in cargo boats and the freights charged from different countries vary from month to month in accordance with the supply of and demand for space in the vessels. In the case of imports, the steamer freight is usually included in the cost of the produce and the rates are quoted c. i. f. Indian ports.

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## INTER-CHAPTER EIGHT.

India produces large quantities of potatoes, but production is not evenly distributed throughout the country with the result that the produce has to be moved from place to place. Bengal, the Central Provinces, Orissa and Bombay in particular are not self-sufficient and have to import large quantities every year.

Out of the total annual produce in the United Provinces, about 710,000 maunds are sent annually to the Punjab, Delhi and Bengal and to some of the Indian States. In spite of large production within its borders, the United Provinces also imports fairly large quantities, mainly from Bihar and the Punjab. The total imports are 440,000 maunds out of which 91 per cent are for consumption and 9 per cent for seed purposes.

In Bihar, the quantity annually produced is estimated at 9,451,000 maunds out of which 1,520,000 maunds are sent to places outside the actual producing areas. Thus, Bihar potatoes are in great demand for seed purposes, and are sent to the Punjab, Bengal and the United Provinces. Table potatoes move from growing centres to towns round about them. Bihar imports about 1,044,000 maunds of potatoes mostly from Simla, Darjeeling and Calcutta mainly for table purposes. Besides, about 60,000 maunds of potatoes are imported across the Nepal frontier and are mostly used as seed.

Bengal is not self-sufficient in respect of potatoes, and has to import large quantities from Burma, Bihar, Assam, the United Provinces, Madras, the Punjab, Nepal and Sikkim, amounting to about 1,900,000 maunds per annum. The annual exports from Assam to other provinces amount to about 132,400 maunds and the quantity of potatoes imported is negligible.

The annual exports of potatoes from the Bombay Presidency are estimated at about 84,000 maunds out of which about 18 per cent are sent to foreign countries and the remainder to adjoining provinces and States. In the Central Provinces, as the local production (which is estimated at 325,000 maunds) is not sufficient to meet the home demand, large quantities amounting to 156,500 maunds are imported annually from Simla, Nainital, Mettupalaiyam, Poona and Bombay. 70 per cent of the imports are received from the United Provinces (Nainital, Dehra Dun and Farrukhabad),

Punjab (Simla, Kalka and Karnal) and Bihar (Patna), 20 per cent from Bombay (Poona and Nasik), and 10 per cent from Madras (Mettupalaiyam), Assam (Shillong), and Bengal.

Madras produces large quantities of potatoes particularly in the Nilgiri Hills and the quantity exported annually is estimated at 208,000 maunds, the chief places of export being Bombay, Calcutta, Secunderabad, Ernakulam, Nagpur, Colombo, Berhampore, Bangalore and Cuttack. Besides direct exports from producing areas, small quantities amounting to 5,400 maunds in 1934, 1,538 maunds in 1935 and 8,200 maunds in 1936 were re-exported from Madras city to Calcutta. Imports into the Madras Presidency are estimated at 175,000 maunds, half of which come from Burma.

In the Punjab, annual exports to outside provinces and States amount to 468,300 maunds. The movement of the produce within the province is also considerable. The traffic (by rail alone) between the principal exporting stations and the main consuming centres amounted to 57,674 and 73,617 maunds in 1934-35 and 1935-36 respectively. Large quantities of potatoes from the neighbouring British territories and hill states are sent to the Punjab exporting stations to be sent down to markets in Bengal, the United Provinces, Bihar, Delhi and the Central Provinces. The markets which import the largest quantities are Ambala, Lahore, Shahpur, Gujrat, Lyallpur, Jhelum, Multan, Rawalpindi, Ludhiana, Gurdaspur, Hoshiarpur and Gujranwala.

In Sind, the estimated exports are about 75,000 maunds, of which Bombay takes 50,000 to 60,000 maunds, and the rest is shared amongst Ceylon, Iraq, Bahrein Island, Muskat Territory and certain Indian States in Kathiawar. Sind imports a little less than one lakh maunds of potatoes, more than half of which come from foreign countries, mainly Italy, and the remainder from Bombay, Farrukhabad, Quetta, Dessa and Simla.

In the Nizam's dominions, the chief centres of production and consumption are the cities of Hyderabad and Secunderabad. As production in these two cities is small, large quantities are imported from outside. Out of the total imports which amount to 46,000 to 54,000 maunds annually, Secunderabad accounts for 62 to 76 per cent.

About 60 per cent of the quantity produced in Baroda is distributed within the State and the rest is exported. Imports'

on the other hand, come from Dessa in Palanpur State, Farrukhabad and Fatehgarh in the United Provinces and Bombay and Poona in the Bombay Presidency.

Of the total produce of Burma, about 849,000 maunds are exported to India and the rest is consumed locally.

Railways are the chief means of transport from producing to consuming centres, but in recent years, the motor lorry has become more popular particularly for transport up to 100—200 miles. The cost of transport is mainly responsible for differences in prices of potatoes between the assembling and the consuming markets.

Although roads are bad in many parts of the country, transportation by road is carried on to a considerable extent, because it possesses certain advantages over transportation by rail. Moreover, there are no railways in certain potato producing areas.

The cost of transportation by carts varies from place to place depending upon local conditions. Carts are very convenient for short distance transport, say, of 20—40 miles.

Motor lorries have recently become more important as means of transport. Although a long time must pass before they can oust bullock carts from the road, lorries have already become serious rivals of the railway. In almost all the provinces, motor lorries are being increasingly used for the transport of potatoes. They have the advantages of cheapness and speed. Motor lorries are extensively used for the transport of potatoes in the Punjab, Bombay, the Central Provinces, Madras and Burma. Lorries ply not only between farms and wholesale depots and from the latter place to the railway station, but also between far off markets, especially in the Punjab and the Central Provinces.

In the Punjab, roads are comparatively better and motor lorries play an important part in the internal distribution of potatoes. Owing to low freights and the elimination of cartage and handling charges, etc., to and from the railway station transport by lorries is preferred by dealers. Large quantities are moved daily from one market to another in this manner and sometimes even to markets outside the province. From Ludhiana, for example, potatoes are transported by motor lorries to such distant markets as Delhi and Agra.

In the Punjab, about 67 per cent of the total quantity of potatoes is carried by rail and about 33 per cent by road

in private lorries. 85·93 per cent of the inter-provincial trade is carried by rail and only 14·07 per cent by road. This is, however, due to longer distances.

In the Central Provinces, the transport of potatoes by motor lorries in those parts where road communications are good has increased considerably in recent years. Of the total potato supplies received in Nagpur from Chhindwara in recent years, roughly 99 per cent was carried by motor lorries and only 1 per cent by rail.

Assam exports annually large quantities of potatoes to Bengal. The main assembling and distributing centre for potatoes in Assam is Shillong which is not connected by rail. Potatoes have, therefore, to be transported by road up to the rail head. Potatoes are exported from the province either via Sylhet or via Gauhati.

The freight charge for potatoes from Shillong to Gauhati according to the schedule is Rs. 1-8-0 per maund, but this rate is very seldom charged as the margin between the ruling prices of potatoes in Shillong and Calcutta markets is too narrow. The freight charge is, therefore, subject to daily fluctuations depending on variations in the prices of potatoes at Shillong and Calcutta.

To fix up the freight, the Manager of the Carrying Company and leading exporters meet every morning and decide among themselves the freight to be charged taking into consideration the prices at Shillong and Calcutta. The rate is fixed in such a way that exporters get a profit ranging from 2 annas to 4 annas per maund after meeting all the expenses connected with transport and marketing. If the price at Calcutta goes up, the Carrying Company increases its charge and thus gets all the benefit from the rise in price, leaving growers and exporters unaffected. On an average, the freight charged from Shillong to Gauhati, a distance of 64 miles, works out at 12 annas per maund or 2·3 pies per maund per mile. Sometimes, for reasons already stated, the freight may be as high as Rs. 1-8-0 per maund. We may compare this with the transport charge in the hilly tract of Nilgiris, *i.e.*, from Ootacamund to Mettupalaiyam, which is 2·1 pies per maund per mile. If merchants and growers in Assam are to get the benefit of rising prices, the monopoly of the transport company should be abolished and rival transport agencies allowed in the field. Alternatively, a lower fixed rate should be charged which would be more in line with rates prevailing elsewhere.

In Madras, transport of potatoes by lorries is very common. Potatoes are carried by motor lorry from Ootacamund and Coonoor to Mettupalaiyam, from Ootacamund to Mysore and Calicut and from Mettupalaiyam to markets in the Coimbatore and Trichinopoly districts. The rate from Ootacamund to Mettupalaiyam, a distance of 32 miles, is Rs. 20 per truck load of 55 to 60 maunds and from Coonoor to Mettupalaiyam, a distance of 21 miles, it is Rs. 12. These work out at 2·1 and 1·8 pies per maund per mile respectively.

In the Bombay Presidency, the motor lorries are now being increasingly utilised for the transport of potatoes and may ultimately oust bullock carts, at least from the good roads. Long distance traffic in potatoes is also being undertaken by motor lorries, such as from Poona to Kolhapur and Bombay, from Khed and Manchar to Bombay, from Belgaum to Dharwar and Kolhapur and from Bombay to Poona district.

It is thus clear that motor lorries play an important part in the transport of potatoes especially within distances of 100 to 200 miles. They have the following advantages over railways: (i) the produce can be loaded from the producer's holding or market and delivered direct at the destination; (ii) incidental expenses at the consigning and receiving stations are avoided; (iii) the dealer who wishes to attend to sales in person can travel free when he engages a whole lorry; (iv) potatoes do not have to be packed in bags resulting in a good deal of saving; and (v) damages resulting from frequent handling at despatching, transhipment and receiving stations are considerably reduced.

Enquiries show that there is an appreciable saving per bag when goods are transported by motor lorries. It is also alleged that in the case of transport by rail at least 3 per cent of the produce is damaged.

Nevertheless, railways remain the largest means of carrying potatoes from one place to another both for short and long hauls. But for railways, the long-distance transport of a perishable commodity like potatoes would have been very difficult. Road competition has in recent years become a serious problem for railways but if a far sighted and liberal policy is followed, as some of the railways in India have begun to adopt, the difficulties would not prove insurmountable.

Potatoes are generally transported by goods trains though small quantities are sometimes taken by passenger trains also. The latter practice is, however, very rare, and is made use of only between places where reduced rates apply. For example,

considerable quantities of potatoes are carried by passenger and parcel trains on the North Western Railway, where liberal concessional rates have been introduced, such as from Rawalpindi and Ferozepur to certain stations. Considerable traffic by passenger and parcel trains also takes place from certain stations in the North-West Frontier Province, Delhi and Jammu Tawi to the chief consuming centres in the Punjab.

There is no provision in the Indian railways for cold storage vans for the transportation of potatoes. This is not very necessary but what is wanted is that potatoes should be transported in insulated vans. The existing steel wagons are not properly ventilated and get heated in transit with the result that potatoes are sometimes heavily damaged. In the summer season, shrinkage and rotting of potatoes during transportation in such wagons are quite high, amounting sometimes to 25 per cent. Most of the railways have provided wooden vans for the transport of delicate fruits. It is desirable that the same arrangement should be made for the transport of potatoes, especially during summer.

The provision of additional facilities for storing and marketing potatoes at the terminal stations as is done in England would be a great convenience to the trade and probably lead to increased traffic being carried by rail.

The general rate for potatoes by passenger and parcel trains is half the parcel rate. This rate is very high and potatoes are, therefore, rarely booked at this rate. For seed potatoes, a certain concession is allowed and the rate charged is  $\frac{1}{4}$  parcel rate. It is, however, necessary for the consignor to produce a certificate from a gazetted officer of the Department of Agriculture to the effect that the potatoes are intended for seed purposes and not for trade. This concession is not, however, availed of, except when the quantity is small and has to be transported quickly, as, in spite of the reduced rate, the transport of potatoes by passenger trains is not sufficiently cheap.

All the commodities booked by goods trains are grouped into 16 classes, and this classification is adopted by all the railways in India. Potatoes are placed in Class 2 when booked at the owner's risk and in class 2-A when booked at the risk of the railway. The telescopic schedule rate varies according to distance, the minimum weight per consignment to which the rate applies being usually 300 maunds on the broad gauge and 160 to 270 maunds on other gauges.

The underlying policy is to encourage long distance transport which would not be possible if the freights were charged at a flat rate for all distances. When, however, goods are carried over more than one railway, the rates are not calculated on the through distance between the two stations but separately for the different railway lines. In the case of goods travelling on more than one railway line, therefore, the benefit of the telescopic scale of rates is comparatively small. In many cases, potatoes are transported over 1,000 to 1,500 miles. As potato is a comparatively cheap commodity, it is desirable that still cheaper rates shall be introduced for very long distances.

The railways have in several cases quoted special station-to-station rates between certain producing and consuming centres with a view to developing traffic. It may, however, be pointed out that both in the case of schedule and station-to-station rates, potatoes are booked at the owner's risk.

All the railways charge wharfage and demurrage both on the inward and outward traffic of potatoes. In the case of both outward and inward traffic, wharfage has to be paid after a period of grace which is usually 24 hours. The charge is usually 3 pies per maund per day. In calculating wharfage, part of a day is reckoned as a full day and a fraction of a maund as a full maund. Demurrage is charged on wagon loads only and the ordinary free-period is 10 hours of day light (7 A.M. to 5 P.M.) from the time the wagon is ready for loading and unloading. The rate of demurrage is usually one anna per ton or part of a ton of the carrying capacity of the wagon per hour or part of an hour.

Owing to the development of roads and railways in the country, the movement of potatoes by river is not very common. The cheap cost of transport by boats is largely balanced by the loss of time involved in this process of transport. There is, however, considerable coastal traffic in potatoes by steamers and country boats.

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## CHAPTER IX.—DISTRIBUTION.

## A.—General.

Assembling and distribution are closely related. The former deals with the movement of the produce from the farm to the wholesaler's godown and the latter with its subsequent movement through the different intermediaries to the consumer. Practically, all the agencies engaged in the assembling of potatoes also take part in its distribution. The different channels through which the produce passes are shown in the diagram facing this page. It may, however, be noted that the list of intermediaries is by no means exhaustive and complete, though in general the diagram shows the channels of distribution of potatoes for consumption.

## B.—Wholesale distribution.

## (1) AGENCIES AND METHODS.

The wholesale distribution of potatoes is undertaken by one of the following agencies: (a) producers, (b) village merchants, (c) commission agents, (d) wholesale merchants and (e) co-operative societies.

(a) *Producers*.—The producers sell their produce mainly to the village merchants and the visiting buyers and dealers in their own villages or in the neighbouring *hats*. This practice is common in parts of Madras, Bengal, the Punjab (mostly hills) and Assam. In other parts, the growers usually take their produce to the neighbouring wholesale markets. The producers' activities are mostly confined to the villages and their immediate neighbourhood. The small quantities which they sell to retail dealers or consumers at the *hat*, as in Assam, Bengal and Bihar, are negligible.

In the distribution of seed potatoes, however, growers take a fairly important part. At Patna (Bihar) and Farrukhabad (United Provinces), for example, well-to-do growers distribute large quantities of seed potatoes on wholesale basis. The proportion of such produce distributed by them is estimated to be roughly 45 per cent. The distribution of seed potatoes is dealt with in detail under the Chapter on "Seed".

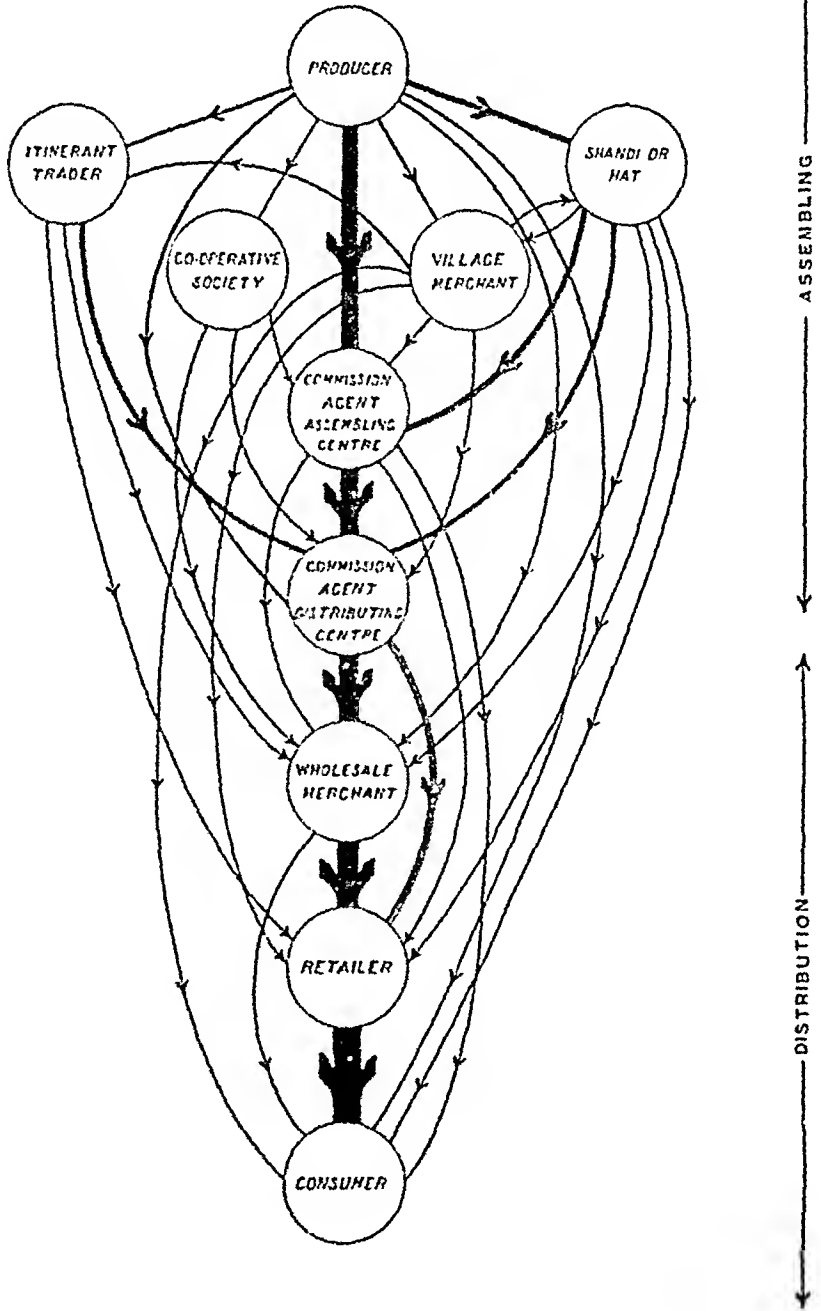
On the whole, the growers do not play a very important part in the distribution of the produce for table purposes. This is so because they do not know when and where to sell and have no knowledge of the trend of prices prevailing in the various markets.

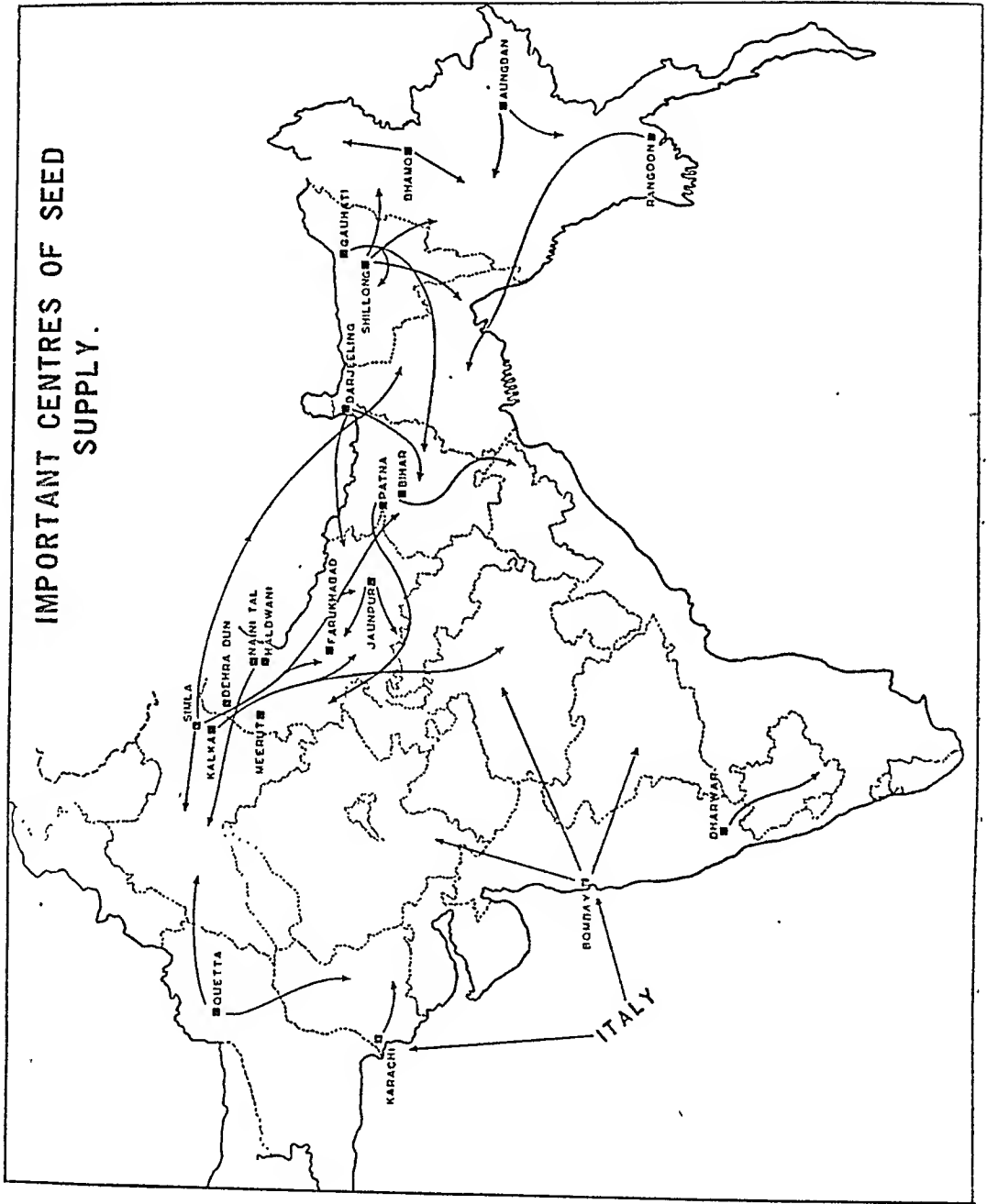
In Burma, the producers do not undertake the wholesale distribution of potatoes.

(b) *Village merchants*.—Distribution of potatoes by village merchants or *beoparis* is fairly popular in the Punjab, Bengal, Assam and Madras. They operate in the area of production and buy the produce directly from the growers in their villages or in the local markets. Later on, they sell it in the same village to visiting merchants or in some neighbouring market to wholesalers or retailers and sometimes even to consumers.

In the hills of the Punjab and the United provinces, the producers do not generally take their produce to the market because of the transport difficulties. They usually sell it to a village *bania* who sends it to an adjoining market for

## MAIN CHANNELS OF ASSEMBLING AND DISTRIBUTION OF POTATOES





sale through a commission agent. The village merchants in the Kumaon Hills of the United Provinces direct their supplies to Haldwani, those in the Simla Hills to the Simla market and those in Kangra Hills to Jogindarnagar and Harbagh markets for sale on a commission basis.

In Bihar, the village merchants do not as a rule take any important part in the distribution of the produce. Sometimes, however, they buy small quantities from the growers and sell them in the same village to visiting merchants. In Bengal, the village merchants generally act as representatives of the commission agents. They take seed potatoes from them and advance the same to the growers from whom they buy the produce at harvest time. This system is common in the districts of Hooghly, Burdwan and Birbhum. In Assam, the bulk of the produce is purchased by the village merchants either in the villages or in *hats* and sold to wholesale dealers in Shillong. A comparatively small part of the produce is also sold by the producers directly to the Shillong wholesalers.

On the whole, the quantity distributed by village merchants is roughly estimated at 10 per cent of the total produce in the Punjab, 6 per cent in Bengal, 50 per cent in Assam, 5 per cent in Madras and 1 per cent in Bihar.

In Burma, the village merchants do not take any part in the wholesale distribution of potatoes.

(c) *Commission agents*.—The commission agents constitute the most important agency for the distribution of potatoes. There are two types of commission agents : those who deal mainly in heavy commodities like wheat, rice, etc., and have taken up the potato trade as a side line and those who deal in vegetables only or sometimes in fruits also. The former class of commission agents is found mainly in the Punjab, particularly in Simla, Kalka, Jullundur, Rohtak, Amritsar and Multan markets, and is mostly engaged in the export of potatoes. This class does not usually import the produce from other markets. Most of the potatoes exported from the Punjab pass through the hands of these *arhatiyas*. The other type of commission agents is common all over the country and is sub-divided into two classes : (a) those who maintain regular establishments (*i.e.*, an office, *munshis* and servants) and records of daily transactions, and (b) those who neither keep any establishment nor maintain any record. The former type of commission agents is most common in the bigger markets like Calcutta, Bombay, Madras, Delhi, Lahore, etc. Besides handling the local produce, they also deal in the import and export of potatoes. They play an important part in inter and intra-provincial trade. Commission agents of class (b) are more or less temporarily established in business, and the sphere of their activities is confined to the local produce only.

Barring the differences explained above, the general methods of working of both classes of commission agents are the same. They act as intermediaries between the buyers and producers and help in settling the prices. In the case of produce imported from other markets, they arrange for its transport from the railway station to the market and its subsequent handling. They pay the freight, octroi and other incidental charges in the first instance, and deduct them later on from the sale proceeds. They have full authority to arrange the sale in whatever manner they like.

The consignors depend upon the honesty of the commission agents to whom they send the produce for sale and accept whatever sale proceeds are remitted to them. The growers and merchants establish favourable business

relations with particular commission agents in different markets and usually get their produce marketed through them. Most of them who operate in the bigger consuming centres maintain their own representatives in the producing areas, whom they keep informed of the market conditions. This practice is particularly common in the Bombay, Bengal and Madras Presidencies. These representatives canvass among growers and village merchants to send the supplies to their firms for sale on a commission basis. Sometimes, they themselves purchase the produce on the advice of their head offices.

The commission agents and wholesalers advance through their representatives several thousands of rupees every year to the growers either in the form of seed or cash, on condition that the latter would sell their produce through them when the amounts are due for recovery. Some big commission agents advance as much as Rs. 40,000 or so annually. By this arrangement they are assured of adequate supplies.

The commission agents in most markets also work as wholesale buyers i.e., they buy a portion of the produce which is brought to them for sale on commission basis. This practice is open to serious objections. Since the profit and loss of the transaction will affect the commission agent's own pocket, it is not likely that he will pay a favourable rate to the consignor who may be ignorant of market conditions being, sometimes, hundreds of miles away. To safeguard his own interest he is likely to pay the consignor a low rate. In the Madras Presidency, it was observed that a certain grower sent a few bags of potatoes for sale on commission to one of the commission agents at Madras and he was informed by the latter that the produce was sold at the rate of Rs. 7 per bag. On inspection, however, it was found that some of the bags in question were lying unsold and others had been sold at the rate of Rs. 9 per bag. This is only one of many instances. The distant sellers are often dissatisfied with sales through commission agents and prefer to sell the produce locally. To encourage sales in consuming markets, it is desirable that the purchase by the commission agents of the produce sent to them for sale on commission should be made illegal and the rate of commission fixed.

Most of the commission agents in the producing areas also supply potatoes to orders received from merchants in other markets. Such orders are executed either from their own stocks or after making the necessary purchases from the market. In the absence of recognised standards, it is not always easy to know the right type of produce desired by the clients. The commission agents, however, know from their experience the requirements of particular markets and despatch the consignments accordingly. In spite, however, of the care and judgment exercised by them it is not always possible to satisfy the purchasers. Naturally, therefore, there are numerous complaints. The practice, however, continues as it saves a lot of time and the expense involved in personal visits to the producing areas. When the potatoes are supplied to order, the necessary arrangements for containers, conveyance, etc., are made by the commission agents concerned and expenses incurred on such items are realised from the purchasers. The commission charged by the commission agents for their services varies from place to place.

Potatoes are supplied to the outside buyers either by open delivery system or by delivery through a bank or a post office. According to the first system the produce is sent to the buyer without receiving any cash in advance. The purchaser generally pays the value of the produce within 10 to 15 days of taking delivery. This system involves a certain amount of risk on the part of the commission agent. Such supplies are generally, therefore, made only

to those dealers who have big business connections, and who are fully known to the commission agents at despatching stations. On the whole, only about 10 per cent of the trade is conducted on these lines and that too mostly in the Punjab. In the second system, which is more commonly adopted, the buyer pays a part of the price in advance. In certain markets the commission agents have fixed the rate of such advances. For instance, one of the leading exporters in Simla demands Rs. 200 per wagon load from the customers in addition to requiring compliance with certain other terms, a copy of which is given in Appendix XXVIII. Another leading firm at Kalka demands Rs. 300 per wagon load in advance. The balance is received through the post office by V. P. P. or by a *hundi* on a bank. In either case, the railway receipt is sent along with the invoice and is delivered to the buyer on payment of the sum stipulated on the V. P. P. or in the *hundi*.

*Hundies* are of two kinds : *darshani hundi* (sight draft) which is payable on demand, and *muddati hundi* (time draft) which is payable after a number of days. In the former case, payment has to be made immediately while in the latter case the amount is paid after 10 to 20 days or in some cases even more. The *darshani hundies* are more commonly used. A copy of the type of *hundies* in vogue is given in the Appendix XXVI.

The proportions of the quantities of potatoes sent out by the commission agents on orders and for sale on a commission basis to other markets vary with the supplies. If the supplies are abundant, the bulk of the produce is sent to other markets by the local commission agents for sale on commission basis. When, however, the supplies are meagre, the produce is supplied mainly to orders received from different markets. For instance, the bulk of the produce exported from Mettupalaiyam from July to January, when supplies are heavy, is sold on a commission basis in the different consuming markets. But later on when the supplies fall off, the produce is sent on receipt of orders. When the potatoes are sent to order, the rates are settled beforehand and the Mettupalaiyam merchants charge a certain amount of commission.

(d) *Wholesale merchants*.—The wholesale merchants also take an important part in the distribution of potatoes. They can be grouped into two classes, viz., those who buy and sell in the same market and those who buy in one market and sell in another. Both types are met with in most of the consuming and distributing markets. The dealers of the first kind operate on a small scale only, handling 4 to 12 maunds every day depending upon their financial position. They visit the market every morning, make purchases through the commission agents and sell the produce in the same agent's stall, as in Calcutta and Lahore markets, without spending any money on stall rent. Wholesale dealers of the second class operate on a large scale. They usually buy a lorry load or so and sell in some other market. They rely on their own ability and knowledge of successful marketing in buying the produce at low rates from one market and selling it at higher rates at another. At some places, the wholesalers also act as commission agents to buyers from distant markets who place orders for potatoes through them. Their methods of business in regard to the supply of potatoes to order are more or less the same as discussed above in the case of commission agents.

In Burma, most of the produce passes through the town traders. About 16 per cent of the total available supply is consigned by the wholesale merchants from the assembling centres direct to the various consuming areas in Upper Burma, Toungoo and Pegu. They make all the necessary arrangements

for sorting, weighing, bagging, stitching and conveyance. The cost of these along with commission and other incidental expenses is realized from the consignee who usually makes payments in about fifteen days.

The remaining 84 per cent of the supplies are sent by the town traders of the assembling markets to Rangoon for sale on a commission basis. The produce is sold to the exporters and local wholesalers. The commission agents usually sell the produce on credit, but they generally settle the consignor's account soon after the disposal of the produce and pay the sale proceeds from their own pockets.

(e) *Co-operative societies*.—The activities of the co-operative societies in the wholesale distribution of potatoes are extremely limited. The amount handled by them is almost negligible, and they exist only in Madras, Sind and Bombay. In the Madras Presidency, the Nilgiri District Potato Agricultural Produce Crop Sale Society, Mettupalaiyam, has been playing an important part for the last two years in the distribution of the produce of its members. The quantity of potatoes distributed by this society in 1938-39, amounted to 12,605 maunds. The produce of the members is assembled at Mettupalaiyam and is either sold to local wholesalers, or sent to other places where sale organisations of other co-operative societies exist. It is not, however, sent to commission agents as they cannot always be relied upon.

The Malir Co-operative Sale Society in Sind has been very useful to its members. During the period 1933-34 to 1936-37, it distributed 60,775 maunds of potatoes out of which 45,631 maunds were sold in the local market at Karachi and 15,144 maunds in Bombay. It has, however, now suspended its activities owing to certain internal difficulties.

At Belgaum in the Bombay Presidency, there is a society of vegetable growers known as the Belgaum Gardeners' Co-operative Production, Supply and Sale Society. This society was started in 1934 and the total quantity of potatoes distributed by this society up till April 1940 was 36,834 maunds.

From the foregoing discussion of wholesale distribution of potatoes it is evident that the producers do not play any important part in this work. The village merchants do contribute their share but in most cases they act as representatives of commission agents. The most important agencies for distribution are the commission agents and wholesalers. Not only does the greater part of the produce pass through their hands, but they also undertake to finance the cultivators. They render an important service, although sometimes they charge heavily for it. The role played by the co-operative societies is altogether negligible. There appears to be considerable scope for their development and it is desirable that every possible encouragement should be given to the formation and proper working of co-operative sale societies for the purpose of distribution not only in the producing areas but also in the leading consuming centres.

### C.—Retail distribution.

There is no specific organisation for the retail distribution of potatoes in any market in India. In almost all the markets, transactions are settled by bargaining. Higgling is common and the retailer tries to charge whatever he can. Sometimes a wholesaler may act as a retailer or vice versa.

#### (1) AGENCIES AND METHODS.

The agencies concerned in the retail distribution of potatoes are : (a) producers, (b) village merchants, (c) wholesale dealers and (d) green grocers.

(a) *Producers*.—The grower as a rule, plays only a minor part in the retail distribution of potatoes. The duties of the cultivator on the farm do not leave him sufficient time to undertake this business. In Madras, Hyderabad and Cochin, the producers do not take any part in retail distribution. At other places too, their share of this work is limited. In Bengal, Sind and Travancore State, for example, it is estimated to be only 10 per cent, 1 per cent and 2 per cent respectively of the total produce. In places where the growers do take up this business they either sell the produce directly to the consumer or take it to the nearest *hat* and sell it to retailers or consumers. In Patiala State, some of the growers take their produce in carts to the surrounding villages and sell it in exchange for grains. Growers who live in the vicinity of large towns take a comparatively greater part in the retail distribution of their produce. Those who produce small quantities generally sell them in retail.

In Burma, apart from a negligible quantity sold in the local bazárs at Aungban, Kalaw, Myitkyina, etc., the growers have no hand in the retail distribution of potatoes.

(b) *Village merchants*.—Although the village merchants distribute comparatively larger quantities than the producers they do not play a very important part in the retail distribution. In the producing areas they buy a few bags of potatoes from the cultivators and sell it in retail to non-growers of the village. They also sometimes take the produce to *hats* for retail sale. In Sind, the village merchants play a more important role in this respect than in the other provinces. It is estimated that in this province roughly 25 per cent of the total quantity of potatoes is retailed by village merchants.

(c) *Wholesale dealers*.—Some wholesalers also deal in retail trade as in the Central Provinces, Madras, Bombay, Orissa, the United Provinces, Travancore, Patiala and Cochin. Some of them are known to possess their own retail shops. The extent of their trade is, however, rather limited. In the other provinces and States and in Burma, wholesale dealers do not take part in the retail distribution of potatoes.

(d) *Green grocers*.—Green grocers are the most important agency for retail distribution of potatoes. They are responsible for about 75 per cent of the retail trade. In certain parts of Bengal, their share is 90 per cent and in the Central Provinces and Berar it is even higher. The green grocers usually deal in all kinds of vegetables. It is only in a few big markets such as Calcutta, Madras and Bombay that some retailers confine their trade to potatoes only.

As regards their primary functions, all the retail dealers are alike but they may be divided into two main groups, *viz.*, shop-keepers or stall-holders and hawkers.

(i) *Stall-holders*.—The stall-holders operate individually and are generally scattered all over the town. Their number is comparatively larger in prosperous localities than in poorer ones. Usually they sell only vegetables but in certain cases they deal in fruits also. The big stall-holders who have shops in rich localities generally stock potatoes of superior quality and charge slightly higher prices. They attend the wholesale market every morning and make purchases according to their requirements. Retailers have neither associations nor any other organised system for making purchases. After buying the necessary requirements, they take the stock of vegetables to their respective stalls at their own expense. Before putting them up for sale, they



sort out the tubers into two or three classes and each lot is sold at a separate price. There is no officially recognised method of grading in any market. The grocer exercises his own judgment and sorts out his produce according to his own individual fancies. Generally, size is the main consideration. The quantity handled by a retailer varies with the season and the locality in which he operates. A rough estimate of the quantities of potatoes handled daily by different classes of retailers at Lahore (Punjab) during the different seasons of the year is given in the following table :—

*Estimated quantities of potatoes handled daily by different types of stall-holders.*

Class of retailers.	Quantity handled daily. (Maunds).		
	From December to end of March.	April to end of June.	July to end of November.
1. Big shopkeepers . . . . .	5	4	3
2. Small shopkeepers . . . . .	2½	1½	1½
3. Petty shopkeepers . . . . .	1½	1	½

(ii) *Hawkers*.—Hawkers trade from house to house. In addition to potatoes they carry three or four different kinds of vegetables in a basket and hawk them from door to door. Every morning they attend the wholesale market to make purchases for the day. They themselves carry the vegetables and do not pay anything for transport or for rent of stall, etc. They can, therefore, afford to sell cheaper than the stall-holders. In addition to the basket men, there is another important class of hawkers which operates on a comparatively larger scale. These hawkers put the vegetables in a small cart which is pulled by a bullock, a pony or a man. They usually remain on the main roads as the cart cannot enter the narrow streets.

The number of hawkers varies with the season. In the winter months in the plains, when supplies are abundant, their number is large. When potatoes become scarce, most of them take to fruits or other vegetables which may then be in season. The hawkers are rendering a very useful service to the trade. They carry the produce to the consumers' doors and are largely responsible for the wide distribution of potatoes and other perishables.

In Burma, the system of retail distribution of potatoes by the green grocers is almost similar to the one in vogue in India.

#### D.—Retail markets.

There are no retail markets exclusively for the sale of potatoes. The retailers usually handle all types of vegetables including potatoes. Retail markets may be divided into two main classes, viz., (1) daily markets and (2) periodical markets.

## (1) DAILY MARKETS.

The markets belonging to this class are held either in the open, on a recognised *pucca* platform specified for the purpose or in the permanent building of a market as in the case of cantonments and most of the important towns. In villages and small towns, the market consists of an unsheltered place—generally under the shade of a tree in summer and outside in the sun in winter. In rural areas they serve both as assembling centres as well as distributing markets. In bigger towns and cities of the provinces of Bombay, Madras and Sind and Hyderabad and Mysore States, however, *pucca* platforms and permanent stalls are built for retailing different commodities. In other provinces and States the number of such markets is comparatively small and these are mostly found in cantonments. In the retail markets in towns, unlike the village retail markets, wholesale distribution of the commodity generally does not take place. The extent of the retail sale of potatoes is different in the different markets. It depends upon the area and the type of customers served by a particular market. The outturn is big in the case of a market situated in a big town or in a prosperous and thickly populated locality.

## (2) PERIODICAL MARKETS.

These markets are held periodically, weekly or bi-weekly. They are quite common in Assam; Bihar, the United Provinces, the Central Provinces, Orissa, Madras and Bengal. These are locally known as *painths*, *hats*, or *shandies*. Amongst them may also be included the markets held from time to time in connection with religious fairs. In the majority of cases, they are owned by private persons who manage all the market affairs themselves and may levy tolls on the produce brought for sale. In Assam, the *hats* are mostly held on government land and are managed by the local boards, particularly in the temporarily settled areas. These are leased out annually to the highest bidders in public auction and the lessees are authorised to levy tolls on the commodities brought in for sale at rates scheduled by the local boards. In the Surma valley and in the Goalpara districts, the *hats* are mostly owned by *zamindars* who may or may not levy tolls. The *hats* situated in the tea gardens are all exempted from market charges.

In Burma, there are three types of retail markets—regular retail markets, periodical bazárs and small town bazárs.

*Regular retail markets.*—These markets are either owned by municipalities or by private persons and firms. The private markets in Rangoon are licensed by the Rangoon Corporation which ensures that they are kept in proper sanitary condition by the owners at their own expense. The municipal markets are under the complete control of the Corporation and a market superintendent is employed to look after all the necessary arrangements.

*Periodical bazárs.*—Markets of this type are found only in the districts adjacent to the Shan States. A group of bazár sellers visit a certain number of villages every fifth day, and sell various articles of luxury as well as vegetables including potatoes. Except in the notified areas, these bazárs are controlled by the local chiefs.

*Small town bazárs.*—These are found in all towns. They are controlled either by the municipalities or by the district councils and are provided with small buildings more substantial than in the case of the five day bazár markets. They are occupied by the permanent stall-holders. The control lies in the hands of a bazár committee appointed by the local bodies concerned. Bye-laws are framed for the systematic working of the markets. In other respects they are similar to the big retail markets described above.

## (3) OWNERSHIP AND CONTROL.

The retail markets are owned either by individuals or by the municipalities or district boards. In Bengal, almost all the markets in the rural tracts and most of the markets in the district towns are owned and managed by the local *zamindars*. The stalls are given to the shopkeepers on rent. Sometimes, the whole of the market is leased out to a contractor who fixes tolls and rents according to the kind of commodity handled and the space occupied. The arrangement of the privately owned markets is in most cases unsatisfactory as regards accommodation, sanitation, etc. In Sind, the Punjab and Bombay, most of the important retail markets are owned by the municipalities concerned and the shops are let out to retailers on monthly rent. The municipal authorities look after the sanitation and management of the markets under their control. In some of the big cities such as Calcutta and Bombay, special market superintendents have been appointed for the purpose. In some markets such as Karachi, Lahore, Bangalore, Calcutta and Bombay, daily, weekly or fortnightly rates of the different commodities are fixed. They are not the actual rates at which the various commodities are sold in the markets, but represent the maximum rates which the retailers are allowed to charge. The actual prices are usually less than the maximum limit fixed. The official rates, as will be seen from Appendix XXVII, do not vary much from day to day, from week to week or from fortnight to fortnight. The same figure is repeated several times while in actual practice the prices fluctuate from day to day. It is said that the official rates are simply intended to give the buyer a general idea about market prices. As, however, they usually differ very widely from the actual prices, they do not serve any useful purpose. It is desirable that the market conditions should be studied more carefully by the municipal authorities so that it might be possible to give more accurate information to the buyers. The prices should be published daily and not weekly or fortnightly as is the case in most markets at present. Moreover, the municipal authorities should exercise a more effective control over the markets under their jurisdiction with a view to checking malpractices and enforcing standard weights.

**E.—Total assembling and distribution costs.**

Costs of distribution of potatoes comprise all charges incurred in the movement of the produce from the grower's field to the wholesaler's premises. They include handling and transportation charges, commission agents' commission, brokerage, sewing and bagging expenses, cost of bags, market fee and other incidental charges. These charges vary according to the extent of the movement and the channels through which the produce passes. As a rule, when the produce is sent to distant markets, the cost of distribution is comparatively greater because the transport charges are higher and the produce has to pass through a large number of intermediaries, each of whom charges something for his services. The retail distribution costs less than wholesale distribution. In the former case, market fees and other sundry charges are practically negligible whereas in the case of wholesale distribution, a large number of charges have to be met.

The various items of expenditure may be grouped into three heads :—

- (a) Expenses incurred in producing areas up to the time the produce is loaded in rail or cart for transport to another market. The items of cost up to this stage include charges for sorting, bagging, carting to railway station, etc.
- (b) Transport charges to destination.

(c) Expenses at destination. These include commission, market expenses including octroi, terminal tax, and conveyance from the railway station to the buyer's godowns.

The expenses under item (a) above are paid by the consignor who may either be a producer or a wholesale merchant operating at the despatching station. Expenses under items (b) and (c) are paid by the consignee at destination who may be a commission agent or a wholesaler. If the produce is received by the commission agent for sale on commission basis, he later on deducts the amount spent by him from the sale proceeds and remits the balance to the consignor. The expenses at destination differ not only from market to market but also from one commission agent to another in the same market. The same commission agent may also charge different amounts from different individuals according to their mutual relations and the quantity of the produce sold. For example, the commission charged at Lahore is  $5\frac{1}{2}$  pies per maund, while in Mettupalaiyam it is eight annas per bag containing approximately  $2\frac{1}{4}$  maunds. At the latter place some commission agents may charge only four annas per bag. Again, at Bombay some commission agents secretly charge specially reduced rates from important clients. A few examples showing the cost of assembling and distribution on consignments sold in different markets are given below :—

#### Example 1.

Cost of assembling and wholesale distribution incurred on one maund of potatoes produced in a village near Lahore and sold at Lahore.

	A.	P.
Transport from farm to the market . . . . .	0	3
Terminal tax . . . . .	1	9
Gratuity to the municipal <i>moharrir</i> * . . . . .	0	3
Market charges . . . . .	0	9
Total cost per maund . . . . .	3	0

#### Example 2.

Cost of assembling and wholesale distribution incurred on one maund of potatoes produced in Mamari (Burdwan district) and sold at Calcutta.

	A.	P.
Cartage from village to railway station . . . . .	1	6
Transport up to Calcutta . . . . .	2	0
Commission and other expenses . . . . .	4	6
Total cost per maund . . . . .	8	0

\*A member of the subordinate staff of the municipal committee.

*Example 3.*

Cost of assembling and wholesale distribution incurred on one bag of potatoes produced in the Nilgiri Hills and sold at Madras.

	Rs.	A.	P.	
1. Assembling charges—				
Motor lorry charges from Ootacamund to Mettupalaiyam . . . . .	0	10	0	
Godown rent and cooly charges at Mettupalaiyam! . . . . .	0	2	0	
Packing and hiring charges of gunny bags . . . . .	0	2	0	
Handling charges at Mettupalaiyam . . . . .	0	2	6	
Profit of Mettupalaiyam merchant including commission . . . . .	0	12	0	
	1	12	6	
2. Distribution charges—				
Railway freight . . . . .	1	4	0	
Handling charges at Madras . . . . .	0	2	0	
Commission at Madras . . . . .	0	3	0	
	1	9	0	
3. Total . . . . .	3	5	6	or
Total cost per maund . . . . .	1	6	6	

*Example 4.*

Cost of assembling and wholesale distribution incurred on a consignment of 336·5 maunds of imported potatoes received from Bombay by a wholesaler at Katni (C. P.).

	Rs.	A.	P.	
Cost price at Bombay . . . . .	1,657	11	0	
1. Charges of Bombay wholesaler—				
Cartage at Bombay . . . . .	11	13	0	
Cooly hire from shop to market . . . . .	8	5	0	
Hammali (coolly charges) . . . . .	3	4	0	
Cost of bags . . . . .	31	13	9	
Bank commission . . . . .	4	8	0	
Station expenses . . . . .	1	0	0	
Postage . . . . .	0	1	0	
	60	12	9	
2. Distribution charges at Katni—				
Railway freight . . . . .	302	12	0	
Pass <i>chaukidara</i> * . . . . .	0	1	0	
Writing charges . . . . .	0	4	0	
Delivery clerk gratuity . . . . .	1	0	0	
Mukaddam . . . . .	0	1	0	
Unloading charges . . . . .	1	15	3	
Cartage from station . . . . .	1	15	3	
Loading at station . . . . .	1	15	9	
Sorting charges . . . . .	1	0	0	
	311	0	3	
3. Total . . . . .	371	13	0	or
Total cost per maund . . . . .	1	1	8	

\*To the *chaukida* (night guard) who, in a way, looks after the safety of the consignment.

## Example 5.

Cost of assembling and wholesale distribution incurred on 1,000 viss\* of potatoes produced in the Shan States and sold in a market in Rangoon or Calcutta.

	Rangoon.			Calcutta.		
	Rs.	A.	P.	Rs.	A.	P.
1. Cartage from cultivator's holding to broker's house . . . . .	8	2	0	8	2	0
2. Cooly hire and local transport—						
At despatch point . . . . .	3	6	0	5	6	0
At Rangoon (inwards) . . . . .	2	0	0			
At Rangoon (outwards) . . . . .	3	11	0			
At Calcutta . . . . .	3	6	0			
3. Freight—						
By rail (to Rangoon) . . . . .	22	1	0	22	1	0
By steamer (to Calcutta) . . . . .	11	7	0			
4. Commission and brokerage—						
At assembling market . . . . .	6	14	0	16	3	0
At Rangoon including value of gunnies . . . . .	9	5	0			
At Rangoon excluding value of gunnies . . . . .	4	0	0			
At Calcutta including value of gunnies . . . . .	10	4	0			
5. Storage, wharfage and river dues—						
At Rangoon . . . . .	1	7	0	1	7	0
At Calcutta . . . . .	3	14	0			
6. Miscellaneous . . . . .				..		0 12 0
7. Total . . . . .				53	3	0 81 4 0
				or		or
Total cost per maund . . . . .				1	3	6 1 13 7

From the above few examples it is evident that the cost of marketing is mainly dependent upon the distance to which the produce is sent. For instance, in example No. 1, the potatoes were produced locally and were sold in a market near at hand. The costs of distribution, therefore, amounted to three annas per maund only. On the other hand, the charges incurred on potatoes imported from Burma amounted to Rs. 1-13-7 per maund because of the long distance. The cost is also affected by the variation in market charges at different places and by the number of intervening markets. The last factor is particularly important in the case of hill produce. It is first assembled in a primary local market, then it is directed towards a secondary or more important market possibly in the same locality, and finally it is sent to a third market where it finds a profitable sale with the down country consumers. The market charges multiply on the entrance of the produce into every new market and so the costs go up. In the plains, however, the grower should be able to dispose of his produce in a local market or, if necessary, export it directly to some consuming centres. He might thus avoid the multiplication of market charges.

\*A viss is equal to 3·6 lb.

*Distribution.*]

## INTER-CHAPTER NINE.

The problems of assembling and distribution are closely related. "Assembling" means the movement of the produce from the farm to the wholesaler's godown; "distribution" means its subsequent movement through different intermediaries to the consumer. Practically all the agencies engaged in the assembling of potatoes also take part in their distribution.

The wholesale distribution of potatoes is undertaken by the following agencies: (a) producers, (b) village merchants, (c) commission agents, (d) wholesale merchants and (e) co-operative societies.

The activities of producers are confined mostly to the villages and their immediate neighbourhood. In the distribution of seed potatoes, growers take a fairly important part. At Patna (Bihar) and Farrukhabad (United Provinces), for example, well-to-do growers distribute large quantities of seed potatoes on a wholesale basis. The proportion of such produce distributed by them is estimated to be roughly 45 per cent. Growers do not, however, play a very important part in the distribution of table potatoes, as they do not know when and where to sell and have no knowledge of the trend of prices prevailing in the various markets.

Distribution of potatoes by village merchants or *beoparis* is fairly common in the Punjab, Bengal, Assam and Madras. They operate in the areas of production and buy the produce direct from growers. Later on they sell it either in the same village to visiting merchants or in some neighbouring market to wholesalers or retailers or sometimes even to consumers. On the whole, the quantity distributed by village merchants is roughly estimated at 10 per cent of the total produce in the Punjab, 6 per cent in Bengal, 50 per cent in Assam, 5 per cent in Madras and 1 per cent in Bihar. In Burma, village merchants do not take any part in the wholesale distribution of potatoes.

Commission agents constitute the most important agency for the distribution of potatoes. There are two types of commission agents: (i) those who deal mainly in heavy commodities like wheat, rice, etc., and take up the potato trade as a side line, and (ii) those who deal in vegetables only or sometimes in fruits also. The former class of commission agents is found

mainly in the Punjab, particularly in Simla, Kalka, Jullundur, Rohtak, Amritsar and Multan, and is mostly engaged in the export of potatoes. This class does not usually import the produce from other markets. Most of the potatoes exported from the Punjab pass through the hands of these *arhatiyas*. The other class of commission agents, common all over the country, is of two types: (a) those who maintain regular establishments, i.e., an office, *munshis*, servants and records of daily transactions, and (b) those who neither keep any establishment nor maintain any records. The former class of commission agents is most common in the bigger markets like Calcutta, Bombay, Madras, Delhi and Lahore. Besides handling the local produce, such commission agents also deal in the import and export of potatoes. They play an important part in inter and intra-provincial trade. Commission agents of class (b) are more or less temporarily established in business, and the sphere of their activities is confined to the local produce only.

Commission agents act as intermediaries between buyers and producers and help to fix prices. In the case of produce imported from other markets, they also arrange for its transport from the railway station to the market and its subsequent handling. They pay the freight, octroi and other incidental charges deducting them later from the sale-proceeds. They have full authority to arrange the sale in whatever manner they like. Consignors have to depend upon the honesty of the commission agents to whom they send the produce for sale and accept whatever sale-proceeds are remitted to them. Most of those agents who operate in the bigger consuming centres maintain their own representatives in the producing areas whom they keep informed of market conditions. This practice is very common in Bombay, Bengal and Madras Presidencies. These representatives canvass among growers and village merchants to send supplies to their firms for sale on a commission basis. Sometimes they themselves purchase the produce on the advice of their head office.

Commission agents in most markets also work as wholesale buyers, i.e., they buy a portion of the produce which is brought to them for sale on a commission basis. This practice is open to serious objections. Since profit or loss in the transaction must affect the commission agent's own pocket, he is not likely to pay a favourable rate to the consignor who is ignorant of market conditions, being sometimes hundreds of miles away. To safeguard his own pocket he generally pays the consignor a low rate. In the Madras Presidency,



it was observed that a certain grower sent a few bags of potatoes for sale on commission to one of the commission agents at Madras and was informed by the latter that the produce was sold at the rate of only Rs. 7 per bag whereas a portion of the produce, at any rate, was actually sold at Rs. 9 per bag. To encourage direct sales in consuming markets, it is desirable that such practices should be made illegal or the rate of commission fixed by Government.

Most commission agents in the producing areas also supply potatoes to order in other markets. Such orders are executed either from their own stocks or after making the necessary purchase from the market.

Potatoes are supplied to outside buyers either by the open delivery system or by delivery through a bank or a post office. According to the first system, the produce is sent to the buyer without receiving any cash in advance. The purchaser generally pays the value of the produce within 10 to 15 days of taking delivery. This system involves a certain amount of risk on the part of the commission agents and such supplies are, therefore, made only to those dealers who are fully known to them. On the whole, only about 10 per cent of the trade is conducted on these lines and that too mostly in the Punjab. The second system is more commonly adopted and the buyer pays a part of the price in advance. The balance is received through the post office by V.-P. P. or by a *hundi* on a bank. In either case, the railway receipt is sent along with the invoice and is delivered to the buyer on payment of the sum stipulated on the V.-P. P. or in the *hundi*.

Wholesale merchants also play an important part in the distribution of potatoes. There are two classes of them, viz., those who buy and sell in the same market and those who buy in one market and sell in another. Both types occur in most of the consuming and distributing markets. Dealers of the first type operate on a small scale only, handling 4 to 12 maunds every morning, making purchases through commission agents and selling the produce in the same agents' stall, thereby saving stall rent. Wholesale dealers of the second class operate on a large scale. They usually buy a lorry load or so in one place and sell in some other place. Having better knowledge and resources, they buy the produce at low rates in one market and sell it at higher rates in another. In some places wholesalers also act as commission agents to buyers from distant markets who place orders for potatoes through them. In Burma, most of the produce passes through town traders.

The activities of co-operative societies in the wholesale distribution of potatoes are extremely limited. The amount handled by them is almost negligible, and they exist only in Madras, Sind and Bombay. There is, however, considerable scope for their development and it is desirable that every possible encouragement should be given to the formation of co-operative sale societies for the purpose of distribution both in the producing and in the consuming areas.

There is no specific organisation for the retail distribution of potatoes in any market in India. In almost all the markets, transactions are settled by bargaining. Higgling is common and the retailer tries to charge whatever he can. Sometimes a wholesaler may also act as a retailer or vice versa. The grower as a rule plays only a minor part in the retail distribution of potatoes, and only those who produce small quantities sell them retail.

Although village merchants distribute comparatively larger quantities of potatoes than producers, they do not play any important part in retail distribution. In producing areas they sometimes buy a few bags of potatoes from cultivators and sell them retail to non-growers within the village. Some wholesalers also deal in retail trade, *e.g.*, in the Central Provinces, Madras, Bombay, Orissa, and the United Provinces, and in Travancore, Patiala and Cochin States.

Green grocers are the most important agency for the retail distribution of potatoes. They are responsible for about 75 per cent of retail distribution. In certain parts of Bengal, their share is 90 per cent and in the Central Provinces and Berar it is even higher. Green grocers usually deal in all kinds of vegetables. It is only in a few big markets in Calcutta, Madras and Bombay that some retailers confine their trade to potatoes only.

As regards their primary functions, all retail dealers are alike but they may be divided into two main groups, *viz.*, shop-keepers or stall-holders and hawkers. Shop-keepers operate individually and are generally scattered all over a town. They attend the wholesale market every morning and make purchases according to their requirements. After buying the necessary requirements, they take the stock of vegetables to their respective stalls at their own expense. Before putting them up for sale they sort out the potato tubers into two or three classes and each lot is sold at a separate price. There is no officially recognised method of grading in any market.

The quantity handled by a retailer varies with the season and the locality in which he operates. A survey of the quantities of potatoes handled daily by different classes of retailers at Lahore (Punjab) during the different seasons of the year shows that big shop-keepers handle every day about 5 maunds during December to March, 4 maunds during April to June and 3 maunds during July to November. During the corresponding periods, small shop-keepers handle daily  $2\frac{1}{2}$  maunds,  $1\frac{1}{2}$  maunds and  $1\frac{1}{4}$  maunds respectively and petty shop-keepers handle  $1\frac{1}{2}$  maunds, 1 maund and  $\frac{1}{2}$  maund respectively.

Hawkers trade from house to house. In addition to potatoes they carry three or four different kinds of vegetables in a basket and hawk them from door to door. The number of hawkers varies with the season. In winter months in the plains, when supplies are abundant, their number is large.

There are no retail markets exclusively for the sale of potatoes. Retailers usually handle all types of vegetables including potatoes. Retail markets may be divided into two main classes, *viz.*, (1) daily markets and (2) periodical markets. Daily markets are held either in the open on a recognised *pucca* platform specified for the purpose or in the permanent building of a market as in the case of cantonments and most of the important towns. Among periodical markets may be included markets held from time to time in connection with religious fairs. In the majority of cases, they are owned by private persons who often levy tolls on the produce brought for sale.

Retail markets are owned either by individuals or by the municipalities or district boards. In Bengal, almost all the markets in the rural tracts and most of the markets in the district towns are owned and managed by local *zamindars*. Stalls are allotted to the shop-keepers on payment of rent. Sometimes, the whole market is leased out to a contractor who fixes tolls and rents according to the kind of commodity handled and the space occupied. Arrangements in privately owned markets are in most cases unsatisfactory as regards accommodation, sanitation, etc. In Sind, the Punjab and Bombay, most of the important retail markets are owned by municipalities and shops are let out to retailers on monthly rent. The municipal authorities look after the sanitation and management of the markets under their control. In some of the big cities like Calcutta and Bombay, special market superintendents are appointed. In some markets, *e.g.*, in Karachi, Lahore, Bangalore, Calcutta and Bombay, daily, weekly or fortnightly rates

of different commodities are fixed. They are not the actual rates at which the commodities are sold in the market, but represent the maximum rates which retailers are allowed to charge. These official rates are simply intended to give the buyer a general idea of market prices. As, however, they usually differ very widely from the actual prices, they rarely serve any useful purpose. It is desirable that market conditions should be studied more carefully by municipal authorities and more accurate information given to buyers. Prices should be published daily and not weekly or fortnightly as is the case in most markets at present. Moreover, municipal authorities should exercise a more effective control over markets under their jurisdiction with a view to checking malpractices and enforcing standard weights.

The cost of distribution of potatoes comprises all charges incurred in the movement of the produce from the grower's field to the wholesaler's premises. It includes handling and transportation charges, commission agent's commission, brokerage, sewing and bagging expenses, cost of bags, and market and other incidental charges. These charges vary according to the extent of the movement and the channels through which the produce has to pass.

Expenses at the destination differ not only from market to market but also from one commission agent to another in the same market. The same commission agent may charge different amounts from different individuals. The commission charged at Lahore is  $5\frac{1}{2}$  pies per maund, while in Mettupalaiyam it is eight annas per bag containing approximately  $2\frac{1}{4}$  maunds. At the latter place, some commission agents may charge only four annas per bag. Again, at Bombay, some commission agents secretly charge specially reduced rates from important clients.

The cost is also affected by variation in market charges at different places and the number of intervening markets. The last factor is particularly important in the case of hill produce which is first assembled in a primary local market, then directed towards a secondary or more important market, possibly in the same locality, and finally sent to a third market. Market charges multiply and costs go up. In the plains, however, the grower should be able to dispose of his produce in a local market or, if necessary, export it direct to some consuming centre. He may thus avoid multiplication of market charges.

## CHAPTER X.—SEED.

## A.—Supplies.

## (1) QUANTITY.

The quantity of seed potatoes planted per acre varies greatly from province to province according to the size of seed tubers used, the distance of planting, soil conditions and the season of planting. The lowest seed rate of 3 maunds per acre has been reported from Bihar, where the size of seed tubers commonly used for planting varies from  $1/6$  to one inch in diameter, and a maximum of 24 maunds per acre from Madras where seed tubers of 1 to  $1\frac{3}{4}$  inch in diameter are commonly used. The seed rate, however, also varies considerably from place to place within the same province. In Bihar, for example, the seed rate varies from 3 maunds to 15 maunds per acre according to the size of seed tubers. It is worth while investigating why a large quantity of seed should be used if the planting could be properly done with a smaller quantity. Some growers have stated that they plant small tubers in rich soil and large ones in the poor. By experience it has been found that the small tubers give a higher yield than large tubers when planted on rich soils in warm climatic conditions favourable to rapid growth of vegetation and that the large size tubers give higher yield than small ones if planted in soils of average fertility. No data are available on the subject and it is open to question whether the increase in yield is sufficiently large to compensate for the extra amount spent in the case of large seed tubers. The usual difference in the minimum and maximum quantities of seed tubers used in Bihar, for example, is as high as twelve maunds per acre. On the basis of average price of seed potatoes at Patna, the cost of the extra quantity of seed used works out to Rs. 82. To make up for this difference in the initial cost of seed, there should be an increase of about 55 maunds in the yield assuming that the price of potatoes at harvest time is approximately Rs. 1-8-0 per maund. Ordinarily, the difference in yield is not so high.

Seed is the principal item of expenditure in the cultivation of potatoes and the cost on this account, as shown above, varies considerably with the size of seed tubers planted. In view of this fact, it seems desirable that the cultivator should know as to what size of seed potatoes is most economical for planting.

With the exception of the Madras Presidency, nowhere in India has any experimental work been done to find out the relation between the size of seed tubers and the yield. At the Nanjanad Potato Research Station, seed potatoes weighing 1 oz., 2 oz., 3 oz. and 4 oz. were planted at distances of 6", 9" and 12", in rows 2 feet 3 inches apart and the results obtained so far indicate that the yield increases with the increase in the size of seed tubers and also with the decrease in the distance of planting. But the increase does not compensate for the extra quantity of seed in the case of large seeds required for planting. According to the results so far achieved, the most economical size of the seed tuber under the conditions obtaining in the Nilgiris area appears to be  $1\frac{1}{2}$  to 2 oz. with a planting distance of 9" in rows 2 feet 3 inches apart. The results obtained in the Nilgiris, however, cannot be applied to other parts of the country as the climatic and soil conditions vary widely. It seems highly desirable that experiments on the lines of the Madras experiment should also be undertaken in other important potato producing provinces and States so that the cultivators of different areas in India may know as to what is the most economical size of seed potatoes and also the distance between rows and sets in the row, for their respective areas.

The average seed rate per acre used for planting in different seasons in some of the important potato producing provinces and States and the estimated total seed requirements in each case are given below. The variations within the provinces and States are subsequently referred to.

*Seed rate and total estimated quantity of seed potatoes required per annum in different provinces and States.*

Province or State.	Seed rate per acre. (In maunds).	Total requirements.
United Provinces . . . . .	4 to 20	97 0000
Bihar . . . . .	3 to 15	829,000
Bengal . . . . .	4 to 12	535,000
Assam . . . . .	12 to 15	399,000
Bombay . . . . .	4 to 20	267,146
Madras . . . . .	9 to 24	262,200
Punjab . . . . .	7 to 12·25	113,480
North-West Frontier Province . . . . .	9 to 13	40,824
Central Provinces and Berar . . . . .	10 to 12	37,180
Sind . . . . .	5 to 18	60,900
Orissa . . . . .	5 to 8	11,400
Mysore . . . . .	11·3	65,088
Patiala . . . . .	6 to 12	14,983
Baroda . . . . .	15 to 16	10,740
Hyderabad (Deccan) . . . . .	15 to 16	6,000
Gwalior . . . . .	6 to 24	10,000
Other Provinces and States . . . . .	11 to 11·6	177,624
Total . . . . .	..	3,810,565

*United Provinces.*—The seed rate varies according to the size of the tubers. The hill seed potatoes being big (having a diameter of one inch and above), the seed rate in their case is 12 to 14 maunds per acre while in the case of *Phulwa*, *Gola* and *Surkha* varieties, whose seed is obtained locally in the plains and the size of which is small, ranging from  $\frac{1}{2}$ " to  $\frac{3}{4}$ " in diameter, the seed rate varies from 4 to 8 maunds per acre.

*Bihar.*—The cultivators usually use whole tubers for the first crop which is planted in September and October, and the seed rate varies from 3 to 15

maunds. Sometimes when very small tubers are planted, the seed rate is as low as 2 maunds per acre. In the case of the second crop, which is raised from seed tubers imported from hills, the individual tubers are large in size and are cut into 3 to 5 pieces each, and each seed piece is planted separately. The seed rate in their case varies from 4 to 10 maunds per acre. The growers, as a rule, prefer to plant whole tubers as the cut pieces are liable to rot in the soil.

*Bengal.*—The size of seed tubers in the case of Darjeeling, Shillong and Rangoon potatoes is comparatively big and the seed rate varies from 8 to 12 maunds per acre. In the case of local varieties, such as *Shilbilati*, *Pakri*, *Kheri*, *Patnai*, etc., the size of seed potatoes is small, ranging from  $\frac{1}{2}$ " to 1" in diameter. The seed rate in their case varies from 4 to 6 maunds.

*Assam.*—Whole tubers are planted and the seed rate for both the summer and winter crops varies from 12 to 15 maunds.

*Bombay Presidency.*—Cut tubers are used for planting and the quantity of seed varies with the size of seed pieces used. The lowest seed rate of 4 maunds per acre has been reported from Dharwar district and the highest of 20 maunds from Belgaum. In Poona and Satara districts, the seed rate for the summer crop is about 10 maunds and for the winter crop 12 to 15 maunds. In Nasik and Ahmednagar districts, where a large area is put under the winter crop, the seed rate is about 12 maunds per acre.

*Madras.*—Whole tubers are used for planting since cut tubers are reported to rot in the soil. The potato growers in the Nilgiris area use potatoes varying in weight from 0.6 oz. to 2.3 oz. Ordinarily, 8 to 10 bags, each containing about 200 lb., are used for planting an acre. In the Hosur *taluk*, cut tubers are used and the seed rate is about nine maunds per acre.

*Punjab.*—Whole tubers are used for the winter crop and cut ones for the summer crop. The reason for using whole tubers in the former case is that the temperature at planting time is high and cut tubers, if planted, rot in the soil. The seed rate in this case varies from 8 to  $12\frac{1}{4}$  maunds and in the case of the summer crop, when cut tubers are used, from 7 to 10 maunds.

*Central Provinces.*—The practice of planting both whole and cut seed tubers is common. The large size tubers are cut into 3 or 4 pieces and each piece is planted separately. Small tubers are planted whole. The average seed rate in this province is 11 maunds per acre.

*Sind.*—The seed rate varies considerably from one tract to another. In the Malir Tract, which is the most important potato growing area in the province, the seed rate in the case of the *Italian White Round* variety is 15 maunds per acre and in the case of the *White Long* variety it varies from 8 to 10 maunds. In the Khanpur area, which is next in order of importance, the seed rate is about 16 maunds in the case of the Italian variety and about 6 maunds in the case of the *Patnai* and the *Farrukhabadi* varieties, the seed tubers of which are usually small. In the case of the *Gola* variety, the seed rate varies from 17 to 18 maunds per acre. In the Piryalo Tract, the seed rate is about 12 maunds per acre in the case of the *Italian White Round* variety and about five maunds in the case of the *Farrukhabadi* variety.

*Orissa.*—When the planting is done early in the season, i.e., in September-October, usually whole tubers of small size are used and the seed rate varies from 5 to 8 maunds per acre. Later in the season, when planting is done in November, the tubers are cut and the seed rate is about 5 maunds per acre.

**Patiala State.**—Whole tubers are used for the winter crop and cut ones for the summer crop. The seed rate in the former case varies from 6 to 8 maunds when small tubers are used, but is sometimes as high as 12 maunds when large tubers are used, and in the latter case the seed rate varies from 8 to 10 maunds per acre. In the hilly districts, the seed rate varies from 6 to 8 maunds per acre.

**Burma.**—The seed rate varies from about 9 maunds in the case of the summer crop in Kalaw (Southern Shan States) to 17 maunds in the case of the winter crop in the Myitkyina area, the higher seed rate in the latter case being due to the practice of planting potatoes at close distances. In the case of the rain crop, the average seed rate is about 11 maunds per acre.

## (2) SOURCES.

There are two definite areas of potato production in India, *viz.*, the hills and the plains. The question of seed supply in the former case is simple, as the individual grower often sets aside from his produce enough tubers for planting in the next season. At times, however, when he is hard pressed for cash, he may sell the whole of his produce soon after harvest. In such cases, he obtains his seed requirements later by either borrowing or buying seed from another grower. Merchants generally do not play an important part in distributing seed to the local growers in the hills. Occasionally, growers in the hills also buy fresh seed from agricultural farms, particularly those specialising in growing potatoes, not because they are short of seed but for introducing new varieties or getting pure seed of the varieties that they have been already growing. The important potato farms which play some part in the distribution of seed to cultivators are Upper Shillong Farm and Nanjanad Potato Research Station, Nilgiris, Madras.

The supply of seed in the plains, however, presents certain difficulties. Due to the long and hot summer, the tubers do not keep very long and as such they cannot be stored economically except at a few centres such as Patna, Bihar Sharif, Farrukhabad, Jaunpore, Meerut, Poona and Dharwar. In these centres also, potatoes suffer badly in storage, though large quantities are yet stored for distribution locally and also to outside places. The problem of seed supply in a vast country like India where conditions differ widely from place to place is undoubtedly very great. The question has, however, been engaging the attention of several local Governments with a view to developing local sources of seed supply in each province.

The main sources from which the seed supplies are obtained in the plains are discussed below (see also map opposite page 189 showing the main centres of seed supply):—

(a) *Local supplies in the plains.*—In the United Provinces, Bombay, Bengal, Bihar and Mysore, the growers generally retain a certain amount of their produce for planting in the next season. In most cases, the quantities so retained are inadequate to meet the local requirements. In places such as Patna, Bihar Sharif, Farrukhabad, Jaunpore, Meerut, Poona and Dharwar, however, large quantities are stored in spite of considerable damage suffered during storage. This seed is for distribution both locally and to outside places throughout the greater part of Northern India.

(b) *Hill supply.*—Simla, Kumaon, Darjeeling, Khasi and Jaintia Hills are the important sources of supply of seed potatoes to the plains.



The crop in the hills is harvested mainly in August-September, *i.e.*, just a couple of months before the planting season of winter crop in the plains. A fairly high proportion of the produce of the hills is used as seed in the plains. The hill seed potatoes are mainly used in the United Provinces, Bihar, Bengal and Assam, where the planting season lasts till December. In the Punjab, Sind and Western United Provinces, where the planting season of the winter crop falls a little earlier, the hill seed potatoes are not so largely used for this crop. In these provinces, the seed potatoes from the hills are used mainly for planting the summer crop.

Large quantities of potatoes are produced in Nilgiris, but they are not at present used for seed purposes in the plains to an appreciable extent. This is partly due to the fact that in the neighbouring producing areas, *e. g.*, Mysore, Hyderabad and Bombay, the *Italian White Round* variety is preferred to *Great Scot* which is the variety mainly grown in the Nilgiris. The possibility of developing a seed trade in this area needs to be further explored.

(c) *Foreign supply*.—The important countries from which seed potatoes are imported are Italy, Burma and Nepal. Seed from Kenya is also used in small quantities in the hills of Bombay. On an average, about 82,000 maunds of potatoes are imported annually from Italy for seed purposes. 87 per cent of this is imported into Bombay and the remaining 13 per cent into Karachi. The season of import from Italy starts from July but the supplies for seed purposes in Karachi, where planting is done early, are received from the end of August onwards, and in Bombay, where planting is done a little later, from the middle of September onwards. In the case of Karachi, the entire quantity of seed potatoes imported is used for sowings within the province, while in the case of Bombay about 36 per cent of the supply is re-exported to the Central Provinces and Berar, Hyderabad, Baroda and Gwalior States and the remaining 64 per cent is used for planting within the province.

In Italy, the harvesting season of potatoes starts in July. When they are put on the boats, they are quite fresh, but on their arrival in India they are found in a sprouting condition. This is due to the extraordinarily warm and moist conditions prevailing in the ship, partly produced by the tubers themselves by their respiration. The tubers in a sprouting condition are preferred as seed.

From Burma, about 50 thousand maunds of seed potatoes are imported annually into Bengal exclusively for local use.

From Nepal and Sikkim territories, a little over one lakh maunds of seed potatoes are imported into Darjeeling, Ghum and Siliguri from where the bulk is re-exported to Orissa, Bihar and the Eastern United Provinces. In the plains, these potatoes sell as Darjeeling potatoes.

### (3) SUPPLIES OF DIFFERENT PROVINCES AND STATES.

*United Provinces*.—The quantity of seed required annually in the United Provinces is estimated at 970,000 maunds. Of this, 1 lakh maunds are used for planting in the hills and the remainder in the plains. In the hills, the cultivators generally keep their own seed and so are independent of outside sources. In the plains, the potatoes for seed purposes are stored in a few districts such as Farrukhabad, Jaunpore and Meerut. From there, they are distributed to places within the province as well as to places outside. This province exports annually about 60 thousand maunds of seed potatoes. It, however, also imports annually about 40 thousand maunds from Simla, Darjeeling and Patna. Thus, on the whole, it has a balance of trade of 20 thousand maunds in its favour.

The percentage of losses in seed potatoes stored in the plains is very high and the United Provinces Government are now trying to develop the supply of seed from the hills where conditions for storing are more favourable. A scheme for the supply of seed potatoes from the hills was formulated by the Government in 1938 (see Appendix XXXII). The main object of this scheme is to induce the cultivators in the hills to grow potatoes which may be successfully used for seed purposes in the plains. Two crops of potatoes are raised in the hills, one at a higher altitude which is ready for harvest in September-October and the other in valleys which is ready in July. The potatoes, as stated elsewhere, require rest for a period of 2 to 3 months before planting and so the seed of the crop grown in the valleys could be planted in the plains. The potatoes produced at higher altitudes are not suitable for planting in places where early planting is done.

In 1938, 22,400 lb. of *Majestic* and 56,000 lb. of *Dunbar Cavalier* varieties of potatoes were imported from Scotland. These two varieties are considered suitable both for hills and plains. The seed has now been distributed to approved growers in Nainital, Almora and Garhwal districts for being grown at higher altitudes. The idea is to get the seed acclimatised and also to increase the stock. The growers have been supplied with the seeds on condition that they would return to the Government 25 per cent more than the quantity actually advanced to them for planting and will also be willing to sell to the Government the balance of the produce at current rates. The quantity sold to the Government will not, in any case, be less than 3 times the weight of the seed potatoes issued to each individual. For the first one or two years, with a view to increasing the stock, the seed will be sown at higher altitudes. But once sufficient stock has been raised, the potatoes will also be distributed to growers for planting in the valleys. The Government have appointed an adequate staff for the control of the work. The whole area has been divided into several small zones, each being under the charge of an officer of a subordinate cadre, who is to collect and distribute the seed potatoes and to see that the different varieties are not mixed. In due course, when the production of these potatoes in the valley increases, arrangements will be made to collect the produce from the growers at harvest and to store it at higher altitudes till the planting season in the plains, when it will be released for sale through recognised agencies.

**Bihar.**—This is the only province which has a very large surplus of seed for supply to other provinces. About nine lakh maunds of seed potatoes are estimated to be exported annually to other provinces and about  $8\frac{1}{2}$  lakh maunds are used locally. However, this province also imports 60,000 maunds of the seed of the *Surkha* or *Lal* variety from Darjeeling side as this variety deteriorates in the plains and a fresh supply from the hills has to be obtained every third or fourth year to renew the stock. If, however, careful seed selection is made in the fields, it may not be necessary to import such large quantities every year.

**Bengal.**—This province is not self-sufficient so far as the seed supply is concerned. A little over  $5\frac{1}{2}$  lakh maunds of seed potatoes are used annually. Out of this, a little less than three lakh maunds are imported from outside and the remaining two and a half lakh maunds are saved by the producers out of their own crop. The important external sources from which Bengal draws her supply of seed potatoes are Assam, Bihar, Punjab, Burma, Nepal and Sikkim. More than two-third of the supply received from the last two sources is reexported to the United Provinces, Bihar and Orissa. The seed potatoes received from Bihar, on account of their being small in size, are largely in demand as a smaller quantity of such tubers is required for planting an acre and small

seed appears to do better on some of the richer soils. The main difficulty in not storing sufficient quantity of seed tubers in the province is that the losses in about six months' time are very high, so much so that sometimes the entire stock may be lost due to rotting. Until the present methods of storage are improved so as to minimise the loss, growers would not take to storing seed potatoes on a large scale. Bengal's climate which is damp and hot is not suitable for storing seed under ordinary conditions. The only possibility of storing seed potatoes is the cold store. The chief areas of production are within easy reach of Calcutta, and it might be possible to utilise the cold store facilities available there. The commercial possibilities would be worth exploring on an experimental basis.

*Assam.*—It is a self-sufficient province for seed potatoes. The average quantity used annually is about 4 lakh maunds. The main sources of supply in the province are the Khasi and Jaintia Hills. More than 50 per cent of the produce of these hills is used for seed purposes. Cultivators in the hills keep their own seed and in their case the question of securing any seed supply from outside is not of any importance. In the plains of Assam, the cultivators retain the seed of *desi* variety. But the seed of hill varieties has to be obtained every year from Shillong.

Assam has a fairly large surplus of seed potatoes which is exported mainly to Bihar, Orissa, Bengal and the Eastern districts of the United Provinces.

*Bombay.*—The total quantity of seed required annually is estimated at nearly two and two-third lakh maunds. Out of this quantity, about 72,000 maunds are imported annually from Italy and the rest is obtained locally from the stock preserved by the cultivators. In Poona, which is the most important district for potato cultivation in the province, the entire quantity of seed required for the summer crop and about 75 per cent of the quantity required for the winter crop is obtained from the local produce. In the case of the summer crop, 40 per cent of the quantity of the seed potatoes used is from the crop raised from "once grown" Italian seed potatoes, 30 per cent from "twice grown", 20 per cent from "thrice grown" and 10 per cent is from mixed non-descript sources. In the case of the winter crop 25 per cent of the area is usually planted with the fresh Italian seed, 30 per cent with "once grown", 25 per cent with "twice grown" and 20 per cent with "thrice grown" Italian seed.

It is found by experience that Italian stocks degenerate rapidly in the course of three or four seasons, and fresh supplies are absolutely necessary for planting a certain proportion of the area every year. The cost of seed, however, precludes all growers from using fresh Italian seeds for the whole area.

In Satara, Nasik and Ahmednagar districts, the cultivators keep their own seed potatoes and only about 5 thousand maunds of fresh Italian potatoes are obtained from Bombay every year.

In Belgaum district, two-thirds of the quantity required for planting is retained by the growers from their own produce and one-third is obtained from Bombay. Dharwar district gets her fresh supply of seed potatoes mainly from Belgaum and only a very small area is planted with the freshly imported Italian seed potatoes. In Ahmedabad and Kaira districts, the growers do not keep seed potatoes from their own produce and every year they get fresh supply of Italian potatoes from Bombay.

Bombay is rather backward in the matter of seed supply. In last year on account of the War, it was not able to import sufficient quantity of seed potatoes from Italy and the cultivators had to plant most of the area with old stock. As has been mentioned already, the Italian variety deteriorates

rapidly. If fresh supplies are not forthcoming, the cultivators would be hard hit. During the Great War of 1914-18, the supply of seed potatoes from Italy could not be obtained and the area under potatoes went down considerably. In Poona district, for example, the area under potatoes in the year 1914-15, i.e., before the War broke out, was 6,026 acres but, due to the stoppage of fresh seed supply from Italy during the War, the area gradually came down to 2,345 acres by the end of the Great War in 1918-19. In 1919-20, the area was further reduced to almost nothing. This abnormal decrease in 1919-20 was due, in part, to the famine in 1918-19 which was particularly severe in the potato growing tracts. After the War of 1914-18, fresh supplies of seed potatoes were imported every year from Italy and the area in Poona district has now increased to nearly 17,000 acres.

It is not safe to depend for seed supply on foreign sources. This aspect of the problem appears to need more attention. It seems desirable that some varieties, other than *Italian hite Round*, the seed of which could be obtained from sources within India, be tried in the Bombay Presidency, to avoid the risk of stoppage of supplies from foreign sources. The possibility of developing potato cultivation for seed purposes on the hills within the Presidency should also be considered. Mahabaleshwar might be a suitable centre for expanding the area under potatoes. If proper arrangements for seed supply within the province or at least within India are not made, potato cultivation in the Bombay Presidency will always be in danger.

*Madras.*—It is a self-sufficient province for seed purposes. The estimated quantity of seed potatoes required annually is about 262,000 maunds. The growers usually reserve a part of the produce for seed purposes. The climatic conditions for storing in the Nilgiris Hills being favourable, the losses in storage are negligible.

*Punjab.*—The question of seed supply is more acute in the Punjab than anywhere else in India. On account of a comparatively hot summer, potatoes cannot be stored economically for seed purposes. A greater portion of seed potatoes required for planting both the summer and winter crops in the plains is imported from outside the province, excepting a small amount saved from the summer crop for planting the winter crop.

For planting the winter crop, which is the main crop in the plains, seed is imported from Bihar (Patna and Bihar Sharif) and the United Provinces (Farrukhabad, Meerut and Dehra Dun). The seed required for this crop is roughly 88,000 maunds, out of which 66,000 maunds are imported from outside and the remaining 22,000 maunds are saved by the cultivators from their summer crop. The quantity required for planting the summer crop in both the hills and plains is estimated at 26,000 maunds. About 20,000 maunds of seed potatoes for planting this crop are imported from outside, mostly the adjoining Hill States and the remaining quantity is saved out of the local produce particularly for planting the crop in the hills.

High prices have to be paid for the seed required for planting the winter crop. Cultivators would very much like to retain the seed from their own produce, if only they could do so. High losses during storage thwart any attempts in this direction. What is needed is the introduction of improved storage methods. Perhaps the best solution would lie in the opening of cold stores at suitable centres. Recently, a cold store for storing seed potatoes has been opened at Sialkot which is freely utilised by the producers (for details see Chapter on "Storage"). It is desirable that similar cold stores be started at other important centres.

The possibility of supplying seed from the hill crop should also be considered in the Punjab. The main crop of the hills, grown at higher altitudes, is ready in September, but the produce of this crop is not considered suitable for planting in the plains, as the tubers do not germinate properly without a rest of two to three months after harvest. A small crop is raised in the valleys of the Punjab Hills where irrigation facilities are available. This crop is usually ready for harvesting in July and its produce can be used for seed purposes in the plains, as by the time of planting the tubers would be about two or three months old. The question of storing this crop for two to three months deserves consideration. The valleys are generally warm and potatoes left there are liable to rot. To avoid this, seed potatoes from this crop should be selected soon after harvest and taken to a higher altitude for storage till the time of planting in the plains. Strict supervision would have to be exercised so that the potatoes freshly harvested at higher altitudes are not mixed with them. Kangra appears to be a suitable area for trying this experiment. The Punjab Agricultural Department seems to have already taken steps in this direction.

*Sind.*—The supply of seed in Sind also is a difficult problem. Like the Bombay Presidency, it also depends for her supplies on Italy. The position in this case is slightly worse. On account of the extraordinarily hot summers, the cultivators cannot preserve any seed, whereas in Bombay, as pointed out earlier, about 75 per cent of the annual seed requirements are met out of the quantities retained by the cultivators from their own produce. In Sind, the annual seed requirements are 61,000 maunds which are mainly derived from Italy and to a small extent from Farrukhabad in the United Provinces. As the local produce in Sind cannot be stored under ordinary conditions and as there are no hills where potatoes could be raised for seed purposes, utilization of cold storage seems to be the only alternative. There are two big cold stores in Karachi within easy reach from Malir, the most important potato growing tract of the province. A certain amount of seed is already being stored there by some of the growers and the Karachi merchants. But, as the storage charges are rather high, the cold stores are utilised only to a small extent (for detailed information please refer to Chapter on "Storage"). The quantity stored at present is not sufficient for planting the entire area under potatoes. A more promising line of development would appear to be to link Sind and Baluchistan. The *Italian White* variety imported into Sind for seed purposes is grown in Baluchistan also where it is planted in March, i.e., sometime later than the time of harvest in Sind, and is harvested in August and September after which the planting time in Sind commences. It is thus possible for Sind to obtain the supply of the *Italian White* variety from Baluchistan and vice versa. In the event of a rapid increase in the cultivation of this variety in both the provinces, the dependence on foreign supply would speedily cease to exist and both the provinces would derive immense benefit by obtaining their seed requirements from each other.

*Central Provinces.*—The annual seed requirements of the province are approximately 37,000 maunds. Out of this quantity, 90 per cent is imported from outside sources such as Patna, Farrukhabad, Nainital, Simla, Poona and Bombay and the remaining 10 per cent is retained by the cultivators from their own produce. The imports from Poona and Bombay consist entirely of Italian seed potatoes.

At present, due to the potato moth trouble, the loss in storage is high, and so the growers do not generally store large quantities. Perhaps with proper care and preliminary precautions in seed selection and fumigation, the harm done by the moth could be checked to a great extent. An improved

method for storing has been introduced by the Department of Agriculture, as described under the Chapter on "Storage", which is fairly satisfactory and, with proper care, it would be possible to minimise losses to a great extent. If seed potatoes could be locally stored, it might not be necessary to import such large quantities from outside the province.

*Orissa.*—In Orissa, potato cultivation is of very recent origin and the cultivators do not generally store potatoes for seed. Patna and Bihar Sharif being not very far off, the entire quantity of about 11,400 maunds of seed potatoes required annually is obtained from there. Climatic conditions in Bihar and Orissa being more or less similar, the cultivators might also store their own seed potatoes, but due, perhaps, to lack of expert knowledge, the storing of potatoes locally has not become popular.

*Mysore.*—The annual seed requirements of Mysore are approximately 65,000 maunds. Roughly, about 60,000 maunds are obtained from the local produce and only 5,000 maunds are imported from outside, mainly from Dharwar and Bombay. Conditions for storing are fairly satisfactory and the cultivators generally preserve their own seed. A small quantity of the Italian seed potatoes are, however, imported every year to renew the stock, as this variety deteriorates rapidly under climatic conditions obtaining in Mysore. If proper selection of seed is made, it is possible that even this small quantity of Italian seed imported annually can be dispensed with.

*Patiala.*—The total average annual seed requirements of Patiala are roughly about 15,000 maunds. About 80 per cent of the area under this crop is in the hills where there are no difficulties in getting seed potatoes at planting time. The growers generally sell the whole of their produce soon after harvest and buy the seed at planting time in the Solan market from the merchants. Some growers, however, do keep small quantities of seed potatoes from their own produce. In the plains, the area under potatoes is rather small. On account of hot summers, the growers do not keep any seed potatoes but usually get their requirements from Ambala, Farrukhabad, Patna and Dehra Dun. The area under potato cultivation in the plains being small, the question of seed supply in this case is not considered to be a serious problem.

*Kashmir and Jammu.*—The annual average seed requirements in Kashmir State are approximately 10,000 maunds. Out of this, about 6,000 maunds are used for planting in Kashmir and the remaining 4,000 maunds in Jammu. In the former case, the entire quantity is obtained by the growers from their own produce, while in the latter, till recently, growers were not retaining any seed for lack of suitable storing arrangements and the seed requirements were met by imports from outside places such as Patna and Farrukhabad. But recently, a cold store has been constructed at Jammu which is freely used by the cultivators for storing seed and only small quantities are now being imported from outside.

*Baroda.*—About 11,000 maunds of seed potatoes are used for planting in Baroda State. The local conditions are not suitable for storing and the entire quantity required is imported from Bombay. If, however, cold storage facilities were provided, they would possibly be utilised by the cultivators and the necessity for imports from Bombay would not arise.

*Gwalior.*—In Gwalior, potatoes for seed purposes are not generally retained. The average annual seed requirements for planting in the State are estimated at 10,000 maunds. This quantity is obtained mainly from Bombay, Patna and Farrukhabad. The imports from Bombay consist of Italian potatoes.

*Nizam's Dominions.*—The average quantity of seed potatoes required is 6,000 maunds, most of which is obtained from Bombay. Local producers do not know the art of storing. Moreover, potatoes do not keep under ordinary storage conditions. There is a small cold store in Hyderabad, which is at present being used for storing grapes and if accommodation were made available for storing potatoes also, it is possible that growers would take advantage of it. Most of the area under potatoes is in the vicinity of Hyderabad and Secunderabad, and it would be convenient for the growers to keep their seed potatoes in the cold store.

## B.—Distribution.

The agencies engaged in the distribution of seed potatoes are (1) growers, (2) wholesale merchants and commission agents, (3) agricultural associations and co-operative societies and (4) agricultural departments.

### (1) GROWERS.

There are two distinct areas of production, *viz.*, the hills and the plains. In the former case, growers do not take any important part in the distribution of seed potatoes. As stated elsewhere, growers generally keep their own seed potatoes and, occasionally, when short of supplies, they borrow or buy the seed from other growers. Generally, they do not keep any potatoes for selling as seed, but they sell the mixed produce as it comes from the fields from which usually the buyers, the commission agents and the wholesalers select suitable tubers for seed purposes.

In the plains, growers play an important role in the distribution of seed potatoes. In the case of table potatoes, the growers sell the produce to buyers who may not necessarily be growers, but in the case of seed potatoes, the growers of one area sell the seed preserved by them mostly to growers of other areas at the time of planting. The system of distribution adopted in the case of seed potatoes is somewhat different from that used for the ordinary table potatoes. In the latter case, the buyers do not generally visit the exporting stations but order the produce by correspondence. In the case of seed, however, owing to great variations in varieties and quality, the buyers, whether growers or merchants, generally visit the centres of production and make purchases directly from growers or merchants.

In the case of Patna, Bihar Sharif and Farrukhabad, which are the most important seed distributing centres in the plains, roughly 90 per cent of the supplies are distributed by growers and grower-merchants.

The big growers and grower-merchants have large godowns where they keep their own seed potatoes as well as what they buy from small growers, either at the time of harvest or just before the commencement of the season of marketing of seed potatoes.

In the season, individual growers and merchants, from places where seed potatoes are not retained, visit Patna, Bihar Sharif, Farrukhabad, etc., and make purchases directly from growers and merchants. The individual growers make small purchases which are just sufficient for their own requirements, varying from 40 to 80 maunds. The merchants, however, purchase large quantities. As the freight charges on small quantities are comparatively higher than those on wagon loads, a number of small growers from one village combine together, and book a wagon load jointly. It has also been noticed



that sometimes growers of neighbouring villages also join together and book a wagon load to a station convenient to all of them. Sometimes, the petty growers, who want only small quantities of seed potatoes, say, just enough for planting one or two acres, get their requirements through big growers who may be visiting the exporting centres for making purchases.

## (2) WHOLESALE MERCHANTS AND COMMISSION AGENTS.

The commission agents play an important part in the distribution of hill seed potatoes and those imported from foreign countries. They generally do not visit the exporting hill stations but place orders with the commission agents in those markets. Sometimes, they also get seed potatoes from merchants in the exporting centres for sale on a commission basis. The former practice is, however, more common and roughly 60 per cent of the quantity of seed potatoes from hills is obtained on orders.

The commission agents sell the seed to the local growers, and in a majority of cases, credit is given on condition that the growers shall sell their produce through the commission agents from whom they have received advances.

The commission agents and merchants also obtain seed from the exporting centres in the plains such as Patna, Bihar Sharif, Meerut and Farrukhabad for distribution to growers. The quality, variety and size being very important factors, particularly in the case of the seed potatoes preserved in the plains, they have either to go themselves or send their representative for making purchases on the spot after satisfying themselves about quality. The ratio of the seed purchased by merchants and commission agents to that imported direct by the growers is roughly 50 : 50. In recent years, there has been an increasing tendency on the part of the growers to visit the exporting centres themselves for making purchases directly on the spot. This tendency is reported to be due to the high profits charged and the inferior quality supplied by the commission agents.

The distribution of seed potatoes imported from foreign countries such as Italy, Burma and Nepal is done exclusively by the commission agents who import potatoes from these places. In the case of Italy, the commission agents order potatoes on their own account, while in the case of Burma and Nepal, they get them for sale on a consignment basis. Usually, the imported seed is sold on credit to the growers who are charged from Re. 1 to Rs. 1-8-0 per maund more than the current market rates. Besides, the growers have also to give an undertaking to the effect that the produce will be sold through their creditors. The extra price charged seems high when it is remembered that the commission agents get their money back from the proceeds of the crop within about four months. Taking the average price of the seed potatoes in Bombay at Rs. 5-8-0 per maund, the extra price charged, if considered as interest, means a rate of 55 to 82 per cent per annum. This is apart from the commission charged on the sale of the produce of the crop grown from the seed sold to them.

Some of the commission agents in Bombay have appointed special agents in the producing areas for canvassing purposes. These agents go about from village to village, and, when orders for sufficient quantity making a wagon load have been obtained, the head office in Bombay is asked to supply the required quantity, which, on arrival, is distributed among the growers according to their requirements. These agents are responsible for recovering the money from the growers at harvest time.



## (3) AGRICULTURAL ASSOCIATIONS AND CO-OPERATIVE SOCIETIES.

There are very few agricultural associations and co-operative societies of the potato growers for the distribution of seed. Since in many cases, the growers visit the exporting centres personally for making purchases, it is desirable that organizations of the growers should be formed to save the members from the trouble and expenses involved in visiting the exporting stations individually. One or two representatives of the society could be deputed for making purchases. As larger quantities would be purchased, it would be possible to get much better terms. Moreover, such societies could also advance money to the growers for the purchase of seed on more reasonable terms and thus save them from the clutches of the commission agents.

However, it may not be absolutely necessary for the representatives of growers and associations to visit the centres of seed supply if reliable agencies were set up for supplying seed potatoes graded according to approved standards. In this direction, a beginning has already been made and last year an association of growers and merchants in Bihar Sharif dealing in seed potatoes was formed who grade and mark their produce with the AGMARK under the Agricultural Produce (Grading and Marking) Act, 1937, according to certain standards arrived at in consultation with producers and merchants. (For details see Chapter on "Grading and standardisation".)

In the Central Provinces, the Sohagpur Agricultural Association has recently taken a hand in the distribution of seed potatoes to its members. In Sind, up till two years ago, there was a co-operative marketing society of the potato growers of Malir and one of its primary functions was to supply seed to the members. This society worked very successfully for a few years and distributed thousands of maunds of seed, but unfortunately, due to lack of interest on the part of certain office bearers and members, the society has now ceased functioning. It is desirable that the work of the society should be revived and similar societies be formed in other parts.

## (4) AGRICULTURAL DEPARTMENTS.

Some of the Agricultural departments have done considerable work in the introduction of new varieties, but none, excepting the Madras and Assam Departments, has made adequate arrangements for the supply of pure seed to the cultivators. In Assam, there is a potato farm at Shillong from which large quantities of seed potatoes are distributed every year to the growers within and without the province. In Madras also, there is a potato farm at Nanjanad (Nilgiris) which distributes every year fairly large quantities of seed potatoes to the growers in the Nilgiri Hills. The Madras Department of Agriculture distributed 167,720 maunds of seed potatoes in 1935-36.

The yield of the crop in the case of all agricultural commodities depends upon the quality of the seed used, but this is particularly true of potatoes. The yield in this case varies from 20 maunds to as much as 200 to 300 maunds per acre depending largely upon the quality of the seed used. It is, therefore, highly desirable that provinces and States, where potato is an important crop, should start seed farms and undertake the distribution of selected seed as has been done for other commodities, e.g., wheat, rice, etc.

## C.—Prices.

The growers generally do not keep accounts of the prices realised by them. Even when accounts are maintained, all that the books show is the number of baskets or bags sold and the prices realised. No mention whatsoever is made of the size or the origin of the seed tubers sold. As the prices are greatly dependent on the factors mentioned above, the data available do not form a dependable series.

The season of marketing of seed potatoes is usually very short (about two months). During this period, the prices fluctuate violently depending upon the day to day demand and supply. Variation in prices is also due to differences in quality. At Manehar, an important potato growing centre in the Bombay Presidency, for example, the "once grown" Italian seed potatoes were sold in the year 1936 at Rs. 18-0-0 per *palla* of 280 lb., the "twice grown" at Rs. 10-0-0, while those raised from the crop of 3rd and 4th generations were sold at as low a price as Rs. 5-0-0 or Rs. 6-0-0 per *palla*. In the hills, the prices of seed potatoes are usually about 20 to 25 per cent higher than those of table potatoes of average quality from the same source. In the plains, however, the prices of seed potatoes locally preserved are two or three times the prices of ordinary table potatoes. In Patna, for example, the average price of table potatoes in 1936 during September and October was only Rs. 3-6-0 per maund, while that of the seed potatoes was Rs. 8-8-0 per maund. In Burdwan (Bengal) market, the average price of table potatoes in 1935 was Rs. 4-14-0 per maund and that of the seed potatoes Rs. 14-0-0 per maund. Similar differences in the prices of seed potatoes and table potatoes are common in other provinces such as the Punjab, United Provinces, etc.

The prices of seed potatoes in some provinces and the Nizam's Dominions are discussed in the following pages:

*Bihar*.—Patna is one of the biggest markets for seed potatoes in India. Here the potatoes are sorted out into different sizes before sale, and the prices are mainly dependent on the size and quality of the seed tubers. The average prices of seed potatoes of *Phulwa*, *Satha* and *Lal* or *Surkha* varieties, according to size, from 8th September to 15th October, 1939, are given in Appendix XXXI. From these figures it will be seen that the highest prices in the case of all the three varieties are realised for the smallest size of tubers (*i.e.*,  $\frac{1}{2}$ " in diameter), and they have been 53.42 and 70 per cent respectively higher than those of the largest size of seed tubers in all the three cases. This big difference is due to the comparatively greater demand for the smallest size of tubers.

Out of the three varieties mentioned above, the *Lal* or *Surkha* variety fetched the highest prices and *Phulwa* the lowest. The former, on an average, fetched from Re. 0-11-0 to Re. 1-0-0 per maund more than the *Satha* variety, and Rs. 2-2-0 per maund more than *Phulwa*. The *Satha* variety, on the average, fetched Rs. 1-7-0 per maund more than the *Phulwa* variety which fetched the lowest price among these 3 varieties. The high prices in the case of the *Lal* variety are attributed to inadequate supplies. This, in its turn, is due to the fact that it is not stored in large quantities as it does not keep well. The *Satha* variety, as its name indicates, gives a crop in about 60 days. This is also, therefore, in greater demand than the *Phulwa* variety and fetches higher prices.

As may be seen from Appendix XXXI, the prices of seed potatoes of the three varieties vary considerably from day to day, the fluctuation being due to the daily variation in demand and supply and to the absence of knowledge on the part of both buyers and sellers regarding the true position.

*Bengal.*—The average prices of seed potatoes for the period 1932-36 in some of the important markets in Bengal are given in the following table :—

*Prices of seed potatoes.*  
(Per maund).

Name of the market.	Variety.	1932.	1933.	1934.	1935.	1936.
		Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Darjeeling	Red Round .	5 12 0	5 0 0	4 2 0	4 6 0	6 2 0
Do. .	White Round .	4 7 0	4 2 0	3 8 0	3 10 0	5 6 0
Do. .	Nainital .	4 4 0	2 14 0	3 2 0	2 12 0	3 10 0
Burdwan	Patna seed .	..	..	12 8 0	14 0 0	11 0 0
Calcutta .	Rangoon .	5 0 0	5 4 0	5 2 0	4 12 0	5 0 0

From the foregoing table, it will be seen that the Patna seed potatoes fetched the highest price. They are small in size, and, as mentioned already, are greatly in demand in Burdwan, as a comparatively smaller quantity is required per acre and small seed is stated to give better results than large seed particularly in this area. In the case of Darjeeling and Rangoon seed potatoes, which are bigger in size, large quantities are required per acre. They are not, therefore, so much in demand. They are selected from amongst the ordinary table potatoes and are not stored for any length of time. So they sell at prices only slightly higher than the ordinary table potatoes. If the prices of the seed tubers of these two varieties go up, the cultivators purchase the ordinary table potatoes which serve equally well for planting purposes. Another reason for their low prices is that they are available in large quantities during the planting season of the crop in the plains. Rangoon seed potatoes sell at Rs. 4-12-0 to Rs. 5-4-0 per maund and are largely used for planting in the Hooghly district.

In the Darjeeling market, the prices of the *Red Round* variety, which is sold under the name of *Lal* or *Surkha* in Patna, are higher than those of other varieties. This is due to a comparatively greater demand for this variety. This variety as pointed out earlier, also fetches higher prices in the Patna market on account of the special demand for it. The *Darjeeling White Round* variety, being less in demand, fetches comparatively lower prices.

*Assam.*—The prices of seed potatoes in Assam generally vary from Rs. 3-0-0 to Rs. 3-8-0 per maund. Shillong is the main centre from where the seed is distributed to different parts of the province. The prices in this market are usually less by a rupee or so, per maund, than in any other centre in the province. This is mainly due to transport and other charges.

*Bombay.*—Bombay is the largest market for seed potatoes imported from Italy. From here, the supplies are distributed to different areas, and the prices in other markets depend mainly on the prices prevailing in Bombay. During the period 1932-36, the prices in Bombay varied from Rs. 5-2-3 to Rs. 5-14-0 per maund, except in 1935 when they rose to Rs. 8-0-10 per maund owing to the constant fear of the supplies being cut off because of the Abyssinian War. Actually, however, the supplies were not cut off and the merchants

made a handsome speculative profit out of the higher prices that they were able to charge. Ahmedabad and Boriavi are the other two important markets where the Italian seed potatoes are sold. The average prices in these two markets for the period 1932-36 are given in the following table :—

*Prices of Italian seed potatoes in the Ahmedabad and Boriavi markets.*

Year.	Ahmedabad.		Boriavi.	
	Price per maund.		Price per maund.	
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
1932 . . . . .	6 5 0 to	7 10 0	4 12 0 to	5 4 0
1933 . . . . .	6 3 0 to	9 1 0	5 4 0 to	6 3 0
1934 . . . . .	8 2 0 to	9 1 0	6 3 0 to	6 11 0
1935 . . . . .	11 7 0 to	11 14 0	7 10 0 to	8 2 0
1936 . . . . .	6 3 0 to	8 2 0	5 4 0 to	5 11 0
Average . . . . .	7 10 0 to	9 2 0	5 13 0 to	6 6 0

From the foregoing table, it will be seen that in both the markets the prices in 1935 were considerably higher than in other years. As in Bombay, this was due to the Abyssinian War. The *Italian White Long* variety, which is mainly in demand in Ahmedabad, generally fetches from Re. 0-8-0 to Re. 1 per maund more than the *Italian White Round* variety. Excepting 1935, which was an abnormal year, the prices have varied from Rs. 4-12-0 to Rs. 9-1-0 per maund. The prices of Italian potatoes in India depend also on their prices in Italy, and the variations found here may be due to certain causes in Italy.

*Madras.*—The price of seed potatoes for the *Great Scot* variety at Coonoor and Ootacamund has remained more or less at Rs. 4-2-0 per maund throughout the period 1933-34 to 1936-37. There is generally not much of selling and buying in the case of seed potatoes in this province as most of the growers keep their own seed. The export trade to other areas has not been developed.

*Punjab.*—The following table gives the average wholesale prices of two important varieties of seed potatoes in Amritsar market for the period 1932-33 to 1936-37.

*Prices of seed potatoes in the Amritsar market from 1932-33 to 1936-37.*

(Per maund.)

Year.	Surkha Patna.	Gola Dehra Dun.
	Rs. A. P.	Rs. A. P.
1932-33 . . . . .	11 2 3	10 13 6
1933-34 . . . . .	10 0 0	10 4 6
1934-35 . . . . .	10 4 6	10 4 0
1935-36 . . . . .	10 0 0	10 0 0
1936-37 . . . . .	8 4 6	10 4 6

The *Surkha Patna*, as its name indicates, is the *Lal* variety imported from Patna, and the *Gola Dehra Dun* is the *Gola* variety from Dehra Dun. Both these varieties sell at more or less the same price. These prices, however, depend mainly upon prices in the exporting markets. In the year 1936-37, the price of the *Lal* variety was Rs. 2 per maund less than that of the *Gola* variety. This was due to the fall in prices of this variety in Patna on account of large supplies. A similar fall in the prices of this variety in the Burdwan market, which also draws its supply from Patna, was noticed in the same year. With the exception of 1936-37, the prices of both the varieties have remained more or less steady throughout.

*Sind.*—In Sind, Italian potatoes are largely used for seed purposes. The average prices during the period 1932-33 to 1938-39 are given in the following table :—

*Average annual prices of Italian seed potatoes in Karachi.*

(Per maund.)

Years.	Prices.		
	Rs.	A.	P.
1932-33 . . . . .	4	5	0
1933-34 . . . . .	4	12	0
1934-35 . . . . .	5	1	0
1935-36 . . . . .	5	6	0
1936-37 . . . . .	5	4	0
1937-38 . . . . .	4	11	0
1938-39 . . . . .	5	11	0

It will be seen that the prices during this period have fluctuated from Rs. 4-5-0 to Rs. 5-11-0. From 1932-33 to 1935-36, they have steadily risen from Rs. 4-5-0 to Rs. 5-6-0 per maund, but in 1936-37 they came down by 2 annas per maund. The prices in 1935-36 were high because of the Abyssinian War. In 1937-38, they came down but in 1938-39 they went up again by a rupee. These variations are due mainly to variations in prices in the Italian markets.

*Nizam's Dominions.*—In Hyderabad, the *Italian White* potatoes, which are imported from Bombay, are used for seed purposes. The average prices of these seed potatoes during the period from 1934 to 1937 are given below :—

*Average annual prices of Italian seed potatoes in the Hyderabad market from 1934 to 1937.*

(Per maund.)

Years.	Prices.		
	Rs.	A.	P.
1934 . . . . .	8	13	4
1935 . . . . .	9	0	5
1936 . . . . .	8	7	5
1937 . . . . .	8	3	9

It will be seen that the prices of these potatoes, as stated elsewhere, were high in 1935 on account of the Abyssinian War. In other years, they have fluctuated by only a few annas per maund.

From the foregoing discussion, it will be seen that the prices of seed potatoes, as compared with those of table potatoes, particularly in the plains, are very much higher. This is due mostly to the high loss in storage and not necessarily to excessive middlemen's profit as is commonly supposed. If cold storage or some other improved form of storage, e.g., in the hills, were made available, losses would be reduced and would, to that extent, cause a reduction in the price of seed potatoes.

### D.—Quality.

As has already been pointed out, the quality of seed used for planting has a very direct bearing on the profit realised from the harvest. To be considered good seed, the tubers must be (i) true to varietal type, (ii) free from diseases and (iii) in sprouting condition at the time of planting. Such a seed is produced only by healthy, vigorous and high yielding plants true to type. Unfortunately, very few growers take proper care in selecting the right type of seed. The common practice is to use for seed what is left from the season's crop after marketing the best of it. This leads to a rapid degeneration of the stock. If the quality and yield of potatoes are to be materially improved and increased, the present practice of seed selection will have to be greatly improved.

#### (1) VARIETAL PURITY.

It is usually very difficult to obtain seed of pure stock in the market. What is generally available is a mixture of more than one variety. Sometimes, it is not easy to distinguish the tubers of different varieties from one another, particularly when they are small in size and are of the same shape and colour. The plants of different varieties can, however, be easily distinguished in the field. But the cultivators are quite indifferent to the presence of undesirable types. They harvest the crop as a whole, and use this mixed produce as seed next year, or sell the same to other growers. This is a serious mistake. The period of growth and yields of different varieties are different. Only that variety should be sown in an area which is most suited to its soil and climatic conditions. It is highly desirable that the suitable varieties for different localities should be determined by experiment, and only pure stock of such varieties used for planting. The first step to be taken in this connection is to sort out and classify the existing varieties and prepare a detailed description of each variety by which they can be recognised.

In the absence of any reliable and recognised source of seed supply, it is very difficult to get satisfactory seed tubers. Some unscrupulous dealers sometimes take advantage of the similarity of tubers of different varieties and pass on the tubers of one for those of another. The tubers of the *Phulwa* and *Satha* varieties of Bihar, for example, are similar in appearance. The *Satha* variety usually fetches higher prices than the *Phulwa* and very often the tubers of the latter are sold as *Satha*. This is highly undesirable and the buyers are naturally disappointed. Due to the action of some irresponsible persons, a general distrust has been created in the trade. In order to ensure the quality and variety of the seed, a society of potato growers and merchants of Bihar Sharif, who were anxious to do business on honest lines, was formed in 1939. The society was given a Certificate of Authorisation to grade seed potatoes under the Agricultural Produce (Grading and Marking) Act, 1937, the object being, that under the AGMARK, the name of the variety would be specified, and the buyers could rely on the declaration made on the labels regarding the purity of the stock in respect of the variety. The society was able to transact

very good business (for details, see Chapter on "Standardisation"). Other merchants are also grading their potatoes to almost the same standard as fixed under the AGMARK scheme but the buyers preferred to buy the produce bearing the AGMARK. This experiment has proved that there is a definite demand for seed potatoes true to type and it seems desirable to take further steps by which the purity of the seed could be fully assured. Suggestions in this connection are made later.

## (2) FREEDOM FROM DISEASES.

The stock of freshly imported seed potatoes in the plains deteriorates in the course of a few seasons. This is attributed to the lack of proper selection of disease-free seed tubers. Virus disease is responsible for most of the deterioration of potatoes in the plains. It cannot be noticed by mere examination of the seed tubers, and in fact, the tubers in this case are quite sound in appearance and often keep better than healthy ones. It can be detected only when the plants are growing. Other diseases such as "ring" and "dry rot" which are also transmitted through seed tubers can, however, be detected if they are in an advanced stage. Due to lack of proper selection of the seed tubers and the consequent use of unhealthy tubers both in the field and at the time of planting, the diseases multiply rapidly. In the course of a few seasons, the seed from such stock becomes altogether unfit for planting and has to be replaced by fresh stock.

Deterioration is more rapid in places like the Bombay Presidency where cut tubers are used for planting. In Bombay, when the fresh stock of Italian potatoes is planted, the yield is comparatively small. In the second season when it gets acclimatised, the yield increases, but in the third season the yield drops again, and in the fourth season it drops still further, and the stock produced is altogether unfit for seed purposes. The rapid multiplication of disease in this case may be due partly to the high temperature during the growing period of the crop, and partly to the practice of cutting the diseased and sound tubers with the same knife. Moreover, the cut tubers are put in the same container, and by contact of the cut surfaces, the infection spreads from the diseased to the sound tubers. Since the deterioration of potatoes is brought about by diseases which get transmitted through the seed tubers, it is essential that the good quality seed should be reasonably free from diseases. The cultivators are, as a rule, unacquainted with the means by which diseases are spread and usually attribute the occurrence of a disease to nature and variations in climatic conditions. As long as there are no visible signs of rotting or any other defects in the tuber, it is considered to be free from diseases. In order to improve the standard of quality of seed tubers and thereby to stop deterioration of potatoes, the importance of disease-free seed should be demonstrated to the cultivators by conducting trials on their own fields. To get the best results, it is necessary that careful selection of properly developed healthy plants should be made while the crop is growing, and their produce should be specially set apart for seed purposes.

## (3) SPROUTING CONDITIONS.

One of the qualities of good seed is that it should show signs of sprouting at the planting time. Such tubers germinate quickly and give an early crop. The tubers without any signs of sprouting take long to germinate and, if in this case cut pieces are used, they are liable to be attacked by fungus and rot in the soil before producing a plant.

The tubers after harvest need a resting period during which they remain dormant. The period of dormancy usually lasts for two to three months. In the case of some varieties it may last even a little longer. In places where two crops are taken a certain amount of difficulty is experienced in getting the right type of seed which would readily germinate. In the Punjab, for example, the summer crop is planted when the winter crop is being harvested. But the produce of the winter crops cannot be used as seed. The cultivator has got to obtain from the hills the seed that has had the necessary period of rest.

In the Bombay and Madras Presidencies also, two crops are raised. The seed for the winter crop is selected out of the produce of the summer crop. In these parts, the seed tubers get rest for hardly a month and a half. In order to hasten sprouting, the cultivators keep them in a heap in a corner of a room where fire is used for cooking, etc. Sometimes the seed tubers are spread out in the sun. There are also other physical and chemical methods of breaking the rest period and their use under ordinary conditions in India might well be examined. There is also a need for developing varieties with a short resting period for use in areas where double cropping is in vogue.

#### **E.—Control of pure and disease-free seeds,**

From the foregoing discussion on the quality of seed, it is evident that the commercial stocks of seed put on the market are badly mixed, often wrongly named, unproductive and infected with several kinds of diseases. It is highly desirable that the local governments should take steps to improve the quality of seed potatoes. All the existing varieties grown in each province and State should be collected and studied carefully. A detailed description of the characteristics of every variety should be given, so that it may be easily recognised. Suitable varieties giving the best yields in different localities should be selected, and pure stock in each case should be raised by proper field selection.

There are a large number of diseases such as virus, ring, etc., which get transmitted through the seed tubers and which are mainly responsible for the deterioration of the potato crop in the plains. It is, therefore, necessary that the pure stock must also be disease-free. This can only be ensured by careful field selection.

In order to make available stocks of seed potatoes which would be true to variety and at the same time free from diseases, a system of seed certification on the lines of the one working in the United States of America or United Kingdom should be introduced. In practically all the important potato producing countries, such as Germany, United States of America, England, New Zealand and Italy, the system of seed certification has worked successfully for many years. Before this system is introduced in India, it is essential that pure stocks of different varieties should be raised on the Government farms which could be distributed to the cultivators who would undertake to maintain the purity of the stocks under the system of seed certification outlined below :—

The names of the cultivators who are willing to work on the scheme should be registered with a Government Department, and they should be supplied with pure stocks of different varieties. The growing crop should be inspected at two or three stages by an official of the Agricultural Department and if in his final inspection it is found that the crop is true to variety and is reasonably free from diseases, a certificate of purity should be given. In the initial stages of this system, the certificate should be given free of cost, but after the cultivators have realised the importance of the certified seed and the demand for this type of seed has increased, a small fee per acre might be charged for issuing



certificates. In course of time, there should be sufficient income from this source to maintain a separate staff for the purpose. In the United States of America, the inspection fee in 1934 varied from nothing at some places to six dollars an acre at others, a dollar per acre being more commonly charged.

The system of seed certification based on field inspection originated in Germany\* under the leadership of Gehrigotto Apple of the Imperial Biological Institute at Dahlen, Berlin. In 1914, the system was introduced in the United States of America through the advocacy of Dr. Orton and Dr. W. Stewart of the United States Department of Agriculture. The system has attained a great popularity within a short period, and now the bulk of the seed in the important potato growing countries sells under the certificates of purity.

The standards of certification vary from place to place. For example, in the United States of America, where the certificates are issued by 22 separate and distinct agencies, there are considerable differences in the requirements. The situation in 1934 with respect to field inspection, tolerances, etc., in the United States of America and Canada for some of the important diseases is indicated below :—

*Field inspection tolerances.*

—	First inspection			Final inspection		
	United States of America. (Percentage).		Canada	United States of America. (Percentage).		Canada
	Range	Average		Range	Average	
Mosaic . . .	1—5	3.0	2	0.5—5	1.9	1
Leaf roll . .	1—4	2.6	2	0.5—3	1.4	1
Spindle tuber . .	1—5	2.0	2	0.5—5	1.4	1
All virus diseases	2—6	4.2	..	1—5	2.8	..
Black leg . .	1—3	1.8	2	0—2	1.0	1
Weit . . .	1—2	1.9	2	0—4	1.4	1
All diseases . .	2—10	5.7	6	1—10	3.8	3
Varietal mixture .	0.25—5	1.3	1	0—1	0.25	..

A schedule, more or less on the lines indicated in the above table, should be prepared for India. But, before any definite proposals regarding tolerances could be made, it would be desirable that a survey should be made of diseases prevailing in different parts of the country.

\* Jones, L. R. W. A. Orton (1877-1930) : "Phyto-Pathology, Vol. 21, 1931".

## INTER-CHAPTER TEN.

The quantity of seed potatoes planted per acre varies greatly from province to province according to the size of seed tubers used, the distance of planting, soil conditions and the season of planting. The lowest seed rate has been reported from Bihar where the rate is 3 maunds per acre and the size of seed tubers commonly used for planting varies from  $\frac{1}{8}$  to 1 inch in diameter. On the other hand, we find a maximum of 24 maunds per acre in Madras where seed tubers of 1 to  $1\frac{3}{4}$  inches in diameter are commonly used. The seed rate also varies considerably from place to place within the same province. In Bihar, for example, the seed rate varies from 3 maunds to 15 maunds per acre according to the size of seed tubers. It is worth while investigating why a larger quantity of seeds need be used if the planting could be properly done with a smaller quantity. Some growers state that they plant small tubers in rich soil and large ones in the poor. According to them, small tubers give a higher yield than large tubers when planted on rich soils in warm climatic conditions favourable to the rapid growth of vegetation and that large size tubers give higher yield than small ones if planted in soils of average fertility. No accurate data are, however, available on the subject and it is debatable whether the increase in yield would be sufficiently large to compensate for the extra amount spent in the case of large seed tubers. The usual difference in the minimum and maximum quantities of seed tubers used in Bihar, for example, is as high as 12 maunds per acre.

Seed is the principal item of expenditure in the cultivation of potatoes and the cost on this account varies considerably with the size of seed tubers planted. It seems desirable, therefore, that the cultivator should know what size of seed potatoes is most economical for planting. With the exception of the Madras Presidency, nowhere in India has any experimental work been done to find out the relation between the size of seed tubers and the yield. In Bihar, cultivators usually use whole tubers for the first crop and the seed rate varies from 3 to 15 maunds. Sometimes, when very small tubers are planted, the seed rate is as low as 2 maunds per acre. In the case of the second crop, which is raised from seed tubers imported from hills, the individual tubers are large in size and are cut into 3 to 5 pieces and each piece is planted separately. The seed rate in this case

varies from 4 to 10 maunds per acre. Growers as a rule prefer to plant whole tubers as the cut pieces are liable to deterioration in the soil. It seems highly desirable that experiments on the lines of Madras should be undertaken in other important potato producing provinces and States so that cultivators of different areas in India might know what would be the most economical size of seed potatoes, the distance between rows and sets in a row in their respective areas.

There are two definite areas of potato production in India, *viz.*, the hills and the plains. The question of seed supply in the former case is simple as the individual grower often sets aside from his produce enough tubers for planting in the next season. The supply of seed in the plains, however, presents certain difficulties. Due to the long and hot summer, tubers do not keep very long and as such they cannot be stored economically except at a few centres like Patna, Bihar Sharif, Farrukhabad, Jaunpore, Meerut, Poona and Dharwar. Even in these centres potatoes suffer badly in storage ; nevertheless, large quantities are stored for distribution locally and to outside places.

Large quantities of potatoes are produced in the Nilgiris but they are not at present used to an appreciable extent for seed purposes in the plains. This is partly due to the fact that in the neighbouring producing areas, *e.g.*, Mysore, Hyderabad and Bombay, the *Italian White Round* variety is preferred to the *Great Scot* variety which is mainly grown in the Nilgiris. The possibility of developing a seed trade in this area needs to be further explored.

The important countries from which seed potatoes are imported are Italy, Burma and Nepal. Seed from Kenya is also used in small quantities in the hills of Bombay. On an average, about 82,000 maunds of potatoes are imported annually from Italy for seed purposes. 87 per cent of this is imported into Bombay and the remainder into Karachi. The season of import from Italy starts in July and in Karachi, where planting is done early, supplies are received regularly from the end of August onwards, and in Bombay where planting is done a little later, from the middle of September onwards. In the case of Karachi, the entire quantity of seed potatoes imported is used for sowings within the province, while in the case of Bombay about 36 per cent of the supply is re-exported to the Central Provinces and Berar and Hyderabad, Baroda and Gwalior States and the remainder is used for planting within the province.

In Italy, the harvesting season of potatoes starts in July. While potatoes are quite fresh when they are put on the boats,

on their arrival in India, they are found to have sprouted. This happens because of the warm and moist conditions prevailing in the ship. Tubers in a sprouting condition are generally preferred as seed.

The percentage of losses in seed potatoes stored in the plains is very high and the United Provinces Government are now trying to have supplies of seed from the hills where conditions for storing are more favourable. A scheme was set up by this Government in 1938 mainly with a view to inducing cultivators in the hills to grow potatoes which might be successfully used for seed purposes in the plains. As potatoes require rest for a period of 2 to 3 months before planting, the seed of the crop grown in the valleys can conveniently be planted in the plains. Potatoes produced at higher altitudes are not generally suitable for planting in places where early planting is done.

In Bengal, seed potatoes can be stored only in cold storage as the climate, being damp and hot, is not suitable for ordinary storage. The chief areas of production are within easy reach of Calcutta and cold storage facilities available in that city should be utilized at least on an experimental basis. In Bombay, the total quantity of seed required annually is estimated at nearly 2½ lakh maunds, of which about 72,000 maunds are imported from Italy and the rest are obtained locally from the stock kept by cultivators. Experience shows that Italian stocks degenerate rapidly in the course of three or four seasons. As, however, the expensiveness of fresh Italian seeds precludes growers from using them over the whole area of a farm, fresh supplies are used for planting only a certain proportion of it every year. In 1940, on account of the War, Bombay was not able to import sufficient quantity of seed potatoes from Italy and cultivators had to plant most of the areas with old stock. During the Great War of 1914-18 also, seed potatoes could not be obtained from Italy and the area under potatoes went down considerably. This shows that it is not safe to depend on foreign sources for seed supply. This aspect of the problem appears to need more attention and it seems desirable that some varieties other than *Italian White Round*, the seed of which can be conveniently obtained in India, be tried in the Bombay Presidency. Madras, however, is self-sufficient for seed purposes. But in the Punjab, the question of seed supply is more acute than anywhere else in India. High losses during storage discourage cultivators from preserving seed from their own produce. The best solution seems to lie in the opening of cold storage facilities in suitable centres. Recently a cold store for

storing seed potatoes has been opened at Sialkot and it is being freely utilised by producers. The possibility of supplying seed from the hill crops should also be considered. Like Bombay, Sind also depends for her supplies on Italy. The position in this case is slightly worse, as, on account of the extraordinarily hot summer, cultivators cannot preserve any seed and there are no hills where potatoes could be raised for seed purposes. Utilisation of cold storage facilities is, therefore, indicated. There are two big cold stores in Karachi within easy reach from Malir, the most important potato growing tract of the province. The quantity stored at present is not, however, sufficient for the planting of the entire area. A more promising line of development would appear to be in linking Sind and Baluchistan. The *Italian White* variety, imported into Sind for seed purposes, is grown in Baluchistan where it is planted in March, *i.e.*, somewhat later than the time of harvest in Sind, and is harvested in August and September after which the planting time in Sind commences. It is thus possible for Sind to obtain the supply of the *Italian White* variety from Baluchistan and vice versa. With a rapid increase in the cultivation of this variety in both the provinces, the present dependence on foreign supplies would speedily disappear and both the provinces would derive immense benefit by obtaining their seed requirements from each other. In the Central Provinces, the loss in storage is high at present due to the ravages of potato moths and growers do not, therefore, store large quantities. Perhaps with proper care and elementary precautions in seed selection and fumigation, the harm done by the moth could be checked to a great extent. An improved method recently introduced by the Department of Agriculture in this province has been found to be quite satisfactory.

The system of distribution of seed potatoes is somewhat different from the system of distribution of table potatoes. While in the latter case, buyers do not generally visit the exporting stations but order the produce by correspondence, in the case of seed, owing to great variations in varieties and quality, buyers generally visit the centres of production and make purchases direct. In the case of Patna, Bihar Sharif and Farrukhabad, which are the most important seed distributing centres in the plains, roughly 90 per cent of the supplies are distributed by growers and grower-merchants. The bigger growers and grower-merchants have large godowns where they keep their own seed potatoes as also such potatoes as they buy from small growers either at the time of harvest or just before

the start of the seed potato season. During the season, individual growers and merchants from other places visit Patna, Bihar Sharif, Farrukhabad and make purchases direct from growers and merchants. They generally make small purchases just sufficient for their own requirements, varying from 40 to 80 maunds.

Commission agents play an important part in the distribution of hill seed potatoes and those imported from foreign countries. They sell the seed to local growers and in a majority of cases, give credit on condition that the produce shall be sold through them. Commission agents and merchants also obtain seed from the exporting centres in the plains for distribution to growers. Quality, variety and size being very important factors, they either go themselves or send their representatives for making purchases on the spot. Imported seed is usually sold on credit to growers who are charged from Re. 1 to Rs. 1-8 per maund more than the current market rates. Besides, growers have also to give an undertaking that the produce shall be sold by them through their creditors. The extra price charged is high especially in view of the fact that commission agents get their money back from the proceeds of the crop within about four months.

There are very few agricultural associations or co-operative societies of potato growers for the distribution of seed. It is, therefore, desirable that organisations of growers should be formed to save members the trouble and expense of visiting the exporting stations individually. One or two representatives could be deputed for making purchases and bulk purchase would also make it possible to get better terms. Moreover, such societies could also advance money to growers for the purchase of seed on more reasonable terms and thus save them from the clutches of commission agents. If reliable agencies were set up for supplying seed potatoes, graded according to approved standards, it might not even be necessary for representatives of growers and associations to visit the centres of seed supply. Recently, in Bihar Sharif, an association of local growers and merchants dealing in seed potatoes has been formed and members of this association grade and mark their produce under the Agricultural Produce (Grading and Marking) Act, 1937, according to certain standards arrived at in consultation with producers and merchants. As regards agricultural departments, excepting in Madras and Assam, no other Provincial Department of Agriculture has adequate arrangements for the supply of pure seed to the cultivators.

The yield of the crop in the case of all agricultural commodities depends upon the quality of the seed used but this is particularly true in the case of potatoes. The yield in this case may vary from 20 maunds to as much as 200 to 300 maunds per acre depending largely upon the quality of seed used. It is, therefore, highly desirable that provinces and States in which potato is an important crop should open up seed farms and undertake the distribution of selected seed potatoes as has been done for other commodities like wheat, rice, etc.

The season of marketing of seed potatoes is usually very short (about two months). During this period, prices fluctuate violently according to day-to-day demand and supply and differences in quality. At Manchar (Bombay Presidency), for example, the "once grown" Italian seed potatoes were sold in 1936 at Rs. 18 per *palla* of 280 lb., the "twice grown" at Rs. 10, while those raised from the third and fourth generations were sold at as low a price as Rs. 5 or Rs. 6 per *palla*. In the hills, prices of seed potatoes are usually about 20 to 25 per cent higher than those of table potatoes of average quality obtained from the same source. In the plains, prices of seed potatoes locally preserved are two or three times the prices of ordinary table potatoes. In Patna, for example, the average price of table potatoes in 1936 during September and October was only Rs. 3-6 per maund while that of the seed potatoes was Rs. 8-8 per maund. In Burdwan (Bengal), the average price of table potatoes in 1935, was Rs. 4-10 per maund and that of the seed potatoes Rs. 14 per maund. Similar differences in the prices of seed potatoes and table potatoes are noticeable in other provinces, e.g., the Punjab, United Provinces, etc.

Patna is one of the biggest markets for seed potatoes in India. Here, potatoes are sorted out into different sizes and prices are mainly dependent on the size and quality of the seed tubers. The highest prices are realised for the smallest size of tubers ( $1\frac{1}{2}$ " in diameter) and they have been 53, 42 and 70 per cent higher than those of the largest size of seed tubers in the *Phulwa*, *Satha* and *Lal* varieties. Bombay is the largest market for seed potatoes imported from Italy. From here supplies are distributed to different areas, and prices in other markets depend mainly on the prices prevailing in Bombay. Prices of seed potatoes are generally very much higher compared with those of the table potatoes, particularly in the plains. This is due more to a high loss in storage than to excessive middlemen's profit. If cold storage or some other improved form of storage (e.g., in

the hills) could be arranged, losses would be reduced and prices of seed would also come down.

To be considered good seed, tubers must be (i) true to the varietal type, (ii) free from disease and (iii) in sprouting condition at the time of planting. Unfortunately, very few growers take proper care in selecting the right type of seed. The common practice is to use for seed what is left from the season's crop after the best of it has been marketed. This leads to a rapid deterioration of the stock. If the quality of potatoes is to be materially improved and their yield increased, the present methods of selection of seed will have to be altered. The period of growth and the yield of different varieties are different. It is, therefore, highly desirable that varieties suitable for different localities should be determined by experiment and only pure stock of such varieties used for planting. The first step to be taken in this connection would be to sort out and classify existing varieties giving a detailed description of each variety, so that they may be easily recognised.

In the absence of any reliable and recognised source of seed supply it is very difficult to get satisfactory seed tubers. Some unscrupulous dealers sometimes take advantage of the similarity of tubers of different varieties and pass on the tubers of one for those of another. This creates a general distrust in the trade, and buyers also are naturally disappointed. In order to ensure uniformity in the quality and variety of the seed, a society of potato growers and merchants of Bihar Sharif was formed in 1939. The society was given a Certificate of Authorisation to grade seed potatoes under the Agricultural Produce (Grading and Marking) Act, 1937, the object being that, under the AGMARK, the names of the varieties would be specified and buyers would be able to rely on the declaration made on the labels regarding the purity of the stock. The experiment has proved successful and it is hoped that other centres would take similar steps to ensure the purity of the seed.

Due to wrong selection of seed tubers, both in the field and at the time of planting, diseases multiply rapidly. In the course of a few seasons, the seed from unhealthy tubers becomes totally unfit for planting and has to be replaced by fresh stock. Deterioration is more rapid in places like the Bombay Presidency, where cut tubers are used for planting. In Bombay, when the fresh stock of Italian potatoes is planted, the yield is comparatively small. In the second season when it gets acclimatised the yield increases, but in the third season it drops again, and in the fourth



season it drops still further and the stock produced is altogether unfit for seed purposes. The rapid multiplication of diseases in this case may be due partly to the high temperature during the growing period of the crop and partly to the practice of cutting diseased and sound tubers with the same knife. Moreover, cut tubers are frequently put in the same container, and by contact with the cut surfaces, infection spreads from the diseased to the healthy tubers. Since deterioration of potatoes is brought about by diseases which get transmitted through the seed tubers it is essential that good quality seed must be reasonably free from disease. To get the best results, it is necessary that careful selection of properly developed healthy plants should be made while the crop is growing and their produce specially set apart for seed purposes.

After harvest, tubers need rest for a period when they remain dormant. The period of dormancy usually lasts for two to three months, but in the case of some varieties it may last a little longer. In places where two crops are raised, difficulty is experienced in getting the right type of seed which would readily germinate. In the Punjab, for example, the summer crop is planted when the winter crop is being harvested and the produce of the latter cannot be used as seed. The cultivator has, therefore, to obtain the seed from the hills which has had the necessary period of rest. In the Bombay and Madras Presidencies, seed tubers get rest for hardly a month and a half. In order to hasten sprouting, the cultivators keep them in a heap in a corner of a room where fire is used for cooking, etc. Sometimes they are spread out in the sun. There are also other physical and chemical methods of breaking the rest period, and these should be examined. There is also need for developing varieties with a short resting period for use in areas where double cropping is in vogue.

Commercial stocks of seed, put on the market at present, are badly mixed, often wrongly named, unproductive and infected with several kinds of disease. It is highly desirable that provincial and State governments should take steps to improve the quality of seed potatoes. All the existing varieties grown in each province and State should be collected and studied carefully. A detailed description of the characteristics of every variety should be drawn up, so that it might be easily recognised. Suitable varieties giving the best yields in different localities should be selected and in every case pure stock raised by proper field selection.

In order to make available stocks of seed potatoes which would be true to variety and at the same time free from disease, a system of seed certification, as prevalent in the United States of America or United Kingdom, should be introduced. Before, however, this system can be introduced in India, it is essential that pure stocks of different varieties should be raised on Government farms and made available for distribution to cultivators who undertake to maintain the purity of the stock.

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## CHAPTER XI.—FINANCE.

### A.—Introduction.

Finance is the backbone of trade and commerce. No trade can thrive unless it is based on sound financial foundations. The same is the case with agriculture if it is run on commercial lines.

Potato is an important agricultural commodity in India. Any agricultural commodity, before it appears in the market, has a long and eventful history. It is grown and harvested by the cultivator and then delivered to the middleman from whom it passes to the wholesaler. But of all these stages, that of production is the most important. The grower has to be furnished with the initial outlay of capital without which no production will be possible. The agriculturist gets his share of the price only after his produce has been marketed and poor as he is, it is difficult for him to meet the initial and essential outlay independently. The question of finance has, therefore, an important bearing on the production of any agricultural commodity, more so in the case of potatoes which require a comparatively higher initial outlay owing to the cost of seed alone which is as much as 50 per cent of the total cost of cultivation.

### B.—Financial requirements.

#### (1) GROWERS.

As has been mentioned before, the financial requirements of a grower engaged in the production of potatoes are heavy. Seed and manure are his primary requisites. There are great differences in the quantity and quality of the seed used by the farmers in the different producing areas and also in the use of manures and fertilisers, etc. The amount of capital required, therefore, varies from one producing area to another. For example, in India the largest amount of capital is required by the growers of Ahmedabad for raising potatoes in the river-bed of Sabarmati, where apart from the seed rate being high, the crop is heavily manured and the preliminary cultivation is also comparatively costly. The average expenses at Ahmedabad on some of the important items are estimated as under :—

	(Per acre)
Levelling of the land . . . . .	Rs. 20 to Rs. 50
Seed . . . . .	Rs. 180 to Rs. 220
Farm yard manure . . . . .	Rs. 100 to Rs. 120
Castor cake . . . . .	Rs. 50 to Rs. 100
Labour . . . . .	Rs. 30 to Rs. 40
Total . . . . .	Rs. 380 to Rs. 530

The above illustration shows how expensive the production of potatoes is specially in the initial stages. Evidently, therefore, the cultivator who has limited financial resources cannot defray these expenses without external aid.

The cultivators are financed mainly by the following three agencies : (i) commission agents, (ii) wholesale potato merchants and (iii) *sahukars* or *mahajans* (money-lenders). The commission agents give the required financial aid both in kind (seed, castor cake, fertilizers, etc.) and cash. They do not charge any interest but make it a condition that the produce, when ready for marketing, shall be sold through them. The commission charged in such cases is generally one anna per rupee, as against half anna per rupee from

those who do not take any such loans. It is estimated that in the Bombay Presidency, about fifty per cent of the cultivators meet their initial expenses through such loans. Though the commission agents do not appear to charge any interest, yet the element of interest is there and is sufficiently made up by the increased commission rates. A good deal of competition between the merchants, *dalals* and their representatives takes place in the Poona district of the Bombay Presidency to induce the growers to sell the produce through them. Many of them, therefore, make advances of money and seed to the growers directly or indirectly to ensure their clientele. When the commission agents supply seed potatoes on credit, they usually charge 8 annas to 1 rupee per maund more than the current market rate. The cash form of loan is becoming more popular, particularly in the Punjab, as the cultivators have now begun to realise that the commission agents charge higher prices for seed and manure. When a loan is advanced a condition is set forth that all the produce or at least the quantity worth the money lent, shall be sold through him. The commission agent thus ensures the recovery of his loan. But in doing so he puts the grower in a disadvantageous position inasmuch as the latter has to accept any sum which his creditor may be willing to pay, though in most cases the price offered by the agent is not very much different from the ruling price in the market. The fact remains, however, that the cultivator is much handicapped and stands to lose financially.

In some parts of India, *e.g.*, Bengal, Bihar and the United Provinces, the cultivators get the credit from the wholesale merchants or from their landlords. The merchants generally charge an interest of 12 to 25 per cent on their loans. Failing these two sources, the cultivator has to throw himself at the mercy of the money-lender. It is not a pleasant task to obtain credit from a money-lender who very often charges exorbitant rates of interest. The interest generally ranges from 15 to 35 per cent and a large part of the cultivator's profit goes towards the payment of interest on the loan. The interest charges are particularly high in Bengal, the Central Provinces and Orissa. The cultivator, however, has no option and a considerable portion of his hard earned profit goes to fatten the coffers of these village money-lenders and *sahukars*.

In some provinces, the co-operative credit societies loan out money to the cultivators to enable them to defray the initial expenses. But the extent of such help is very meagre and it has not solved the problem to any appreciable extent.

Certain provincial governments also distribute *taccavi* loans to the cultivators. The amount distributed is, however, negligible.

In Sind, the case is slightly different. Here a large number of growers are rich enough to defray their expenses and are not, therefore, so greatly indebted to the wholesalers and commission agents. These cultivators grow tobacco, potato, onion and chillies, all of which are money crops and they finance the production of one crop with the proceeds of the previous one. The Malir Co-operative Society, which has now stopped functioning, used to finance its members only and charged interest at the rate of  $6\frac{1}{2}$  per cent. The society had advanced over two lakhs of rupees.

There is no organised credit system in the country to provide for long term credits to the cultivators who have to work under various disabilities. Due to lack of finance in many parts of India, such as Bengal, the United Provinces, Bihar and the Punjab, the cultivators, in order to cut down their costs of production, have to use small size seed tubers as they are required in comparatively

small quantities for planting an acre. This, however, results in a lower yield. In order to improve the standard of cultivation it is necessary to provide better means of financing the cultivators. The Co-operative Departments can do a lot in this direction by organising credit and sale societies of cultivators.

## (2) COMMISSION AGENTS.

The commission agents play a very important part in financing the marketing of potatoes. They give advances to the cultivators in the form of seed, manure or cash. The amount so advanced is usually repaid by the cultivators after the harvest.

The commission agents also purchase large quantities of potatoes. They have to pay for their purchases immediately. In the case of potatoes that are sold on commission basis, they make immediate payments to sellers but get the money from the buyers after a few days. Some of these commission agents deal in other commodities also such as onion, garlic and ginger and they have to rent large godowns for keeping the produce. For such godowns, they have to pay heavy rent. In some of the big cities such as Calcutta, Bombay, etc., it ranges from Rs. 50 to Rs. 100 per month depending upon the location and size of the godown. In assembling centres, however, the rents are not so high. In Orissa, some of the commission agents advance money also up to 75 per cent of the value of the produce brought to them for sale on commission. From the above account it is evident that the commission agents require large sums of money to carry on their business. The amount of capital which they require varies from Rs. 5,000 to Rs. 50,000, depending upon the extent of the business. Obviously, people with slender means cannot take up this business. The capital employed may all be self-owned or may consist partly of borrowed money. In times of need, they borrow money from relatives, friends and others. Such loans are not registered and are based on personal confidence. In Northern India they are called *hatudharies*. On account of their sound financial position their credit is good, and when necessary they can also borrow money from joint stock banks which usually charge interest at the rate of 10 per cent. The commission agents render an important service although their charges are high. They are the mainstay of the trade and if they were to withdraw their investments, the cultivators would be hard hit.

## (3) RETAIL MERCHANTS.

Retail merchants get their supplies from wholesale merchants or commission agents either on credit or partly on credit and partly on cash payment, depending upon the degree of confidence existing between the two parties. If supplies have been obtained on credit, payment is made after the sale on the following day or in some cases after two or three days. The retail traders do not stand in need of large sums of money as the volume of their business is very small and whenever they want money they get it readily from the wholesalers with whom they keep running accounts. The short period loans, say for a day or a week, required by these retailers are easily supplied by the wholesale merchants or commission agents as the case may be.

In Orissa, the retailers are allowed 36 days as a period of grace after which they have to pay interest at the rate of 12 annas per cent per mensem.

### C.—Possibilities of organisation.

From the foregoing discussion it is clear that the potato grower labours under great financial difficulties. It is, therefore, very important that he should be provided with cheap credit facilities.

The avenues of credit that are now open to him are costly and unfavourable. Whenever a potato grower gets credit from a wholesale merchant or a commission agent, he has not only to pay an exorbitant rate of interest in certain cases but has also to enter into a contract that he will not dispose of his produce except through his creditor. As a result of this arrangement, the cultivator is at a great disadvantage. He is bound to accept any price, reasonable or unreasonable, which his creditor offers. He does not get the actual market price for his produce as in the transactions with his creditor the element of competition is totally absent.

Sometimes the loans consist of seed and/or manure, and often the quality is very poor although the prices charged are very high. The growers are thus being done up in their eyes due to their financial handicaps. It has been observed in Madras that the grower has sometimes to give away the whole of his produce to meet his debts without reserving even for seed. He has to purchase seed potatoes at enhanced rates at the next planting time. This is an intolerable state of affairs for the growers, but they have to face it as they have no other option.

In some places the growers have to spend a large amount of money for procuring seed potatoes of a good quality. The potato growers in the Punjab and the United Provinces have to procure seed potatoes from Bihar and they have to incur some expenses in going there which could certainly be avoided if reliable agencies for supplying good quality seed were established in the exporting centres.

In view of all these difficulties it is essential that potato growers' co-operative societies should be started in the various producing areas to look after the financial requirements of the members. The capital should mostly be subscribed by the members themselves and realised in convenient instalments. The societies should be affiliated to a central bank from which they may be able to obtain loans when necessary. The interest charged from the members should be as low as possible, and the loan should ordinarily be recovered at the time of harvest. The societies might also undertake to provide the members with good seed and manure, and thus save them from the bother and expenditure connected with their personal visits to the seed exporting centres. It seems desirable, therefore, that commission shops on the lines of that opened by the Nilgiri Co-operative Sale Society at Mettupalaiyam should be started to help the producers in disposing of their produce.

The formation of the co-operative societies appears to be a possible remedy for the financial difficulties of the growers. But the mere existence of societies will be no solution unless they are worked properly and in the true co-operative spirit.

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*Finance.*]

## INTER-CHAPTER ELEVEN.

The question of finance has an important bearing on the production of any agricultural commodity, more so in the case of potatoes which require a comparatively higher initial outlay owing to the cost of seed alone being as much as 50 per cent of the total cost of cultivation.

As has been mentioned before, the financial requirements of a grower engaged in the production of potatoes are heavy. Seed and manure are his primary requisites. There are great differences in the quantity and quality of the seed used by farmers in the different producing areas and also in the manures and fertilizers used.

Cultivators are financed mainly by the following three agencies: (i) commission agents, (ii) wholesale potato merchants and (iii) *sahukars* or *mahajans* (money-lenders). Commission agents give the required financial aid both in kind (seed, castor cake, fertilizers, etc.), and in cash. They do not charge any interest but make it a condition that the produce, when ready for marketing, should be sold through them. The commission charged in such cases is generally one anna per rupee as against half an anna per rupee from those who do not take any cash loans. It is estimated that in the Bombay Presidency, about fifty per cent of the cultivators are financed by commission agents. Though commission agents do not appear to charge any interest, yet the element of interest is there and is sufficiently made up for by increased commission rates. A good deal of competition takes place in the Poona district of the Bombay Presidency between merchants, *dalals* and their representatives to induce growers to sell the produce through them. Many of them, therefore, make advances of money as well as seed to growers in order to retain their connexion with them. When commission agents supply seed potatoes on credit, they usually charge annas 8 to Re. 1 per maund more than the current market rate. The cash form of loan is becoming more popular, particularly in the Punjab, as the cultivator has now begun to realise that commission agents charge higher prices for seed and manure.

In some parts of India, *e.g.*, Bengal, Bihar and the United Provinces, cultivators get credit from wholesale merchants or from their landlords. These merchants generally charge an interest of 12 to 25 per cent on their loans.

These two sources failing, the cultivator has to throw himself on the mercy of the money-lender. It is not a pleasant task to obtain credit from a money-lender who very often charges exorbitant rates of interest. The interest generally ranges from 15 to 35 per cent and a large part of the cultivators' profit goes towards the payment of interest on the loan.

In some provinces, co-operative credit societies loan out money to cultivators to enable them to defray the initial expenses of cultivation. But the extent of such help is still very limited. Certain provincial governments also distribute *taccavi* loans to cultivators. The amount distributed is, however, very negligible.

In Sind, the case is slightly different. Here, a large number of growers are rich enough to defray their expenses themselves and are not, therefore, much indebted to wholesalers or commission agents. The Malir Co-operative Society, which has now ceased functioning, used to finance its members only and charged interest at the rate of  $6\frac{1}{2}$  per cent. The Society advanced over two lakhs of rupees to its members.

Due to lack of finance in many parts of India, such as Bengal, the United Provinces, Bihar and the Punjab, cultivators, hard pressed to cut down their costs of production, have to use small size seed tubers. This results in a lower yield. In order to improve the standard of cultivation, it is necessary to devise better means of financing cultivators. Government co-operative departments can do a lot in this direction by organising credit and sale societies of cultivators.

In the case of potatoes that are sold on a commission basis, commission agents make immediate payment to sellers but get the money from the buyers after a few days. In Orissa, some commission agents advance money up to 75 per cent of the value of the produce brought to them for sale on commission. Thus it is evident that commission agents require large sums of money to carry on their business. The amount of capital which they require varies from Rs. 5,000 to Rs. 50,000, depending upon the extent of their business. The capital employed may be all their own or it may consist partly of borrowed money. In times of need, they borrow money from relatives, friends and others. On account of their sound financial position their credit is good, and when necessary they can even borrow money from joint-stock banks which usually charge interest at the rate of 10 per cent. Commission agents render an important service.



although their charges are high. They are the mainstay of the trade and if they were to withdraw their investments, the cultivator would be hard hit.

Retail merchants get their supplies from wholesale merchants or commission agents either on credit or partly on credit and partly on cash payment, the exact arrangement depending upon the degree of confidence existing between the two parties. In Orissa, retailers are allowed 36 days as a period of grace after which they have to pay interest at the rate of 12 annas per cent per mensem.

The sources of credit that are now open to the potato grower are costly and unfavourable. Sometimes loans consist of seed and/or manure, and often the quality is very poor although the price charged is very high. Often growers have to spend a large amount of money for procuring seed potatoes of a good quality. Potato growers in the Punjab and the United Provinces have to procure seed potatoes from Bihar and have to incur some expenses in having to go there—an expense which could certainly be avoided if reliable agencies for supplying good quality seed were established in the exporting centres.

In view of all these difficulties, it is essential that potato growers' co-operative societies should be started in the various producing areas to look after the financial requirements of the members. The capital should mostly be subscribed by the members themselves and paid in convenient instalments. The societies should be affiliated to a central bank from which they might be able to obtain loans when necessary. The interest charged from members should be as low as possible, and the loan should ordinarily be recovered at the time of harvest. The societies might also undertake to provide members with good seed and manure and thus save them from the trouble and expense of personal visits to seed exporting centres. It seems desirable that commission shops on the lines of the one opened by the Nilgiri Co-operative Sale Society at Mettupalaiyam should be opened to help producers in disposing of their produce.

The formation of co-operative societies appears to be a possible remedy for the financial difficulties of the growers. But the mere existence of societies will be no solution unless they are worked properly and in the truly co-operative spirit.

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## CHAPTER XII.—ASSOCIATIONS.

### A.—General.

In the present world of trade and commerce, groups and associations have become a common and natural feature. Their importance is really great in view of the elaborate and complicated structure of the modern trade. These associations whether in industry or in agriculture or in any other field of economic activity protect their respective members from sudden and instantaneous changes and act as a guide to them.

As compared with countries in the West, India has been very backward in the formation of associations. There are very few of them in agriculture, particularly in the case of potatoes. Their absence amongst the potato growers or traders is probably due to the illiteracy and lack of initiative of the latter.

### B.—Growers' associations.

A few societies of potato growers that exist in India are found in Madras, Bombay, the Central Provinces and Sind.

In Madras, the operation of these societies is confined to the Nilgiri Hills. They are chiefly primary credit societies with the Nilgiri District Potato and Agricultural Producers' Crop Sale Society at Mettupalaiyam as their main pivot. Seventy-two co-operative credit societies and a few individual big growers are members of this central sale society. The Central Bank makes advances of money to the different credit societies at the time of planting. These are recovered, through the sales agency, from the proceeds of the potatoes and other agricultural produce. The primary credit societies collect the produce from the members and send it in lorry loads to the sales agency maintained at Mettupalaiyam. The individual growers who are members of the central society, however, send their produce directly to the sales agency. On receipt of the produce at the commission shop of the society at Mettupalaiyam, it is sorted out into different grades and sold either to buyers at Mettupalaiyam or consigned to sales societies in Madras and other districts. The sales agency, after charging a commission of 3 annas per bag *plus* one anna six pies for sorting, etc., as against four to eight annas per bag charged by other commission agents, sends the balance of the sale proceeds to the Central Bank, which deducts the advances made and remits the balance to the societies concerned for distribution among the members according to the quantities of potatoes supplied by them. Separate accounts of the advances made to the growers and of the quantities of potatoes supplied by them under each grade are maintained by the central society and also by the commission shop of the society at Mettupalaiyam.

The sale society started functioning from July, 1938, and the quantity sold by it till April 1939 was 27,116 maunds. In 1939-40, the quantity handled was 24,322 maunds. The society has its agents at Tanjore, Coimbatore and Madura. All these agents have furnished cash security to the extent of which consignments are allowed. The agents are allowed a commission of five annas per bag of potatoes sold by them. Loans and sale societies and other co-operative institutions are also supplied potatoes and the same rate of commission is allowed to them. Of the total quantity handled by the society, 70 per cent was sold locally, 10 per cent through co-operative institutions elsewhere and the rest in Bombay, Calcutta and Madras markets, etc.

The central society, besides arranging for the sale of the produce, also purchases manure on cash or credit basis and distributes it to the primary societies for re-distribution to the growers. The central society charges a commission of eight annas per bag for this service as against Re. 1 to Rs. 1-8-0

charged by village merchants who also supply manure on credit. Attempts are being made to reduce the charge of the society by 50 per cent. The primary societies repay the cost of the manure to the central society by taking loans from the Central Bank at  $5\frac{1}{2}$  per cent, but recovery from growers is made when the produce is sold.

During 1936, the central society supplied 8,192 bags of manure valued at Rs. 92,060 and on this the society earned a commission of Rs. 5,615. The manures are purchased either at Ootacamund or Coonoor. At the former place rates of the manure sold vary from Rs. 10 to Rs. 12-4-0 per bag, depending upon the composition of the manures and the reputation of the company supplying them. At the latter place, the rates are less by two to four annas per bag due to difference in the cost of transport.

In Bombay, there is only one co-operative sale society called the Belgaum Gardeners' Co-operative Production, Supply and Sale Society which also deals with potatoes. A brief note on the constitution of this Society is given in Appendix XXIX. It was registered in 1934 and its area of operation is confined to the Belgaum city. This society advances loans to the members against property of on the security of other members, procures seeds and manures for them and sells their produce on a commission basis. The society also sells the produce of non-members. The quantities of potatoes sold through the organisation of the society both by members and non-members from 1934-35 to 1938-39 are shown below :—

*Quantities of potatoes handled by the Belgaum Gardeners' Co-operative Society from 1934-35 to 1938-39.*  
(In maunds).

Year.	Members' produce.	Non-members' produce.	Total.
1934-35 . . . . .	11,200	700	11,900
1935-36 . . . . .	7,700	350	8,050
1936-37 . . . . .	5,250	525	5,775
1937-38 . . . . .	4,956	350	5,306
1938-39 . . . . .	5,488	315	5,803
	34,594	2,240	36,834

In Sind, the now defunct Malir Co-operative Sale Society, Ltd., used to advance loans to the potato growers who were members of the society at  $6\frac{1}{2}$  per cent. Membership was confined to the residents of Karachi *taluka* and was restricted to the agricultural class of people only. Besides advancing loans for seed and manure, it also acted as a selling agency for the potato crop of its members. During the period 1933-34 to 1936-37, 60,775 maunds of potatoes were sold by this society on behalf of its members. The society also stored large quantities of seed potatoes in the cold stores at Karachi for distribution to the members. Owing to certain internal troubles, however, it has suspended its activities for the time being.

In the Central Provinces, no special societies of potato growers exist but there are several agricultural associations which help the potato growers in various ways. In 1935, the Sohagpur Agricultural Association deputed an

Agricultural Assistant to Simla who purchased good seed potatoes and got them carefully packed and sent to Sohagpur for distribution to the members. The association advanced the money for the purchase and other incidental expenses. This amount was recovered from the growers, and on the whole a saving of 50 per cent in the price was effected by direct purchase of the seed at the exporting centre.

In the United Provinces, there are no potato growers' associations except the co-operative societies recently started in some villages near Bhowali and Garmpani in the district of Nainital. The primary object of these societies is to enable the farmers to obtain a fair price for their produce, to ensure the supply of well graded products to the purchasers and to check fraudulent methods practised by the various agencies.

From the above account it is evident that the potato growers have very few organised associations of their own for credit or other purposes.

As has been pointed out in the Chapter on "Finance", the most serious difficulty that the potato growers in India have to face is the procuring of necessary money for the initial outlay in production particularly for seed and manures. For this they have to depend on the commission agents or the money-lenders. In the former case they have to pay an unduly high rate of commission and in the latter an exorbitant rate of interest. In order to save the growers from this exploitation, it is necessary that growers' associations should be started. By the nature of the service that they are intended to render growers' associations must be for credit purposes in addition to functioning as sale agencies for the produce of their members.

The associations should be formed on a co-operative basis. The working capital should be obtained by shares subscribed to by members and by getting loans from banks. The associations should advance money to the members to enable them to meet their initial expenses in production and might also provide them with seed and manure. This would enable the members not only to obtain good quality of seed and manure but also to make purchases at cheaper rates.

These associations may also take up the task of selling the produce of their members and thus ensure their legitimate share in the ultimate price of the commodity. They could also undertake grading and standardisation of the produce which affect the price considerably by enlarging the market. It is hoped that associations organised on these lines would prove very useful.

Co-operative marketing has its advantages and disadvantages. The success of such co-operative marketing societies is largely, if not entirely, dependent upon the ability and honesty of those entrusted with the task and the loyalty of the members of the society. The organisation must also have good management and sufficient volume of business. If these conditions are fulfilled, there is no reason why co-operative marketing should not succeed in the country.

### C.—Traders' associations.

In India, there are no potato traders' associations in the true sense of the terms. There is one association at Karachi called the Fruits and Vegetables Merchants' Association. But this is an unregistered body without any rules and regulations. In case any merchant does not take delivery of goods, delays in making the payment, proves a defaulter or is otherwise undesirable, he is boycotted. The other dealers stop giving him goods, etc. Petty disputes among the members are settled by the association and thus litigation is avoided.

Interests of the members are safeguarded and grievances against the railway, municipality, etc., are redressed through the association. Similar unregistered associations of merchants also exist in several other markets. Their main functions are to safeguard their common interests.

In Assam, the potato trade is in the hands of a few wholesalers who are generally Marwaris. Although no regular association exists, yet there is a sort of understanding among these merchants. They occupy an almost monopolistic position in this trade and can dictate the price at which they would purchase the commodity. The growers have no alternative and have to accept the terms offered.

In Bengal, there is no organised traders' association for potatoes excepting in Calcutta where the potato merchants have a common understanding. As the interests of the merchants are identical and as they have got their godowns located in one market called Alooposta, they fix up the price, by mutual agreement, at which potatoes imported from Rangoon are to be sold at wholesale rates from time to time.

In Burma, the exporters have an association. This association is organised to regulate exports to India. The B. I. S. N. Co. have recognised this association and the produce of the members alone is accepted for shipment to India. The quantity of the produce that each member can export is determined on the basis of the business done by him during the previous years.

The above account clearly indicates that regular associations of growers and merchants are almost non-existent. It is highly desirable, therefore, that the growers and merchants should have their own separate organisations to look after their interests.

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## INTER-CHAPTER TWELVE.

Compared with Western countries, India has been very backward in the matter of forming producers' associations. There are very few of them in the potato trade due mainly to the illiteracy and lack of initiative of both growers and traders.

The few societies of potato growers that exist in India are found in Madras, Bombay, the Central Provinces and Sind. In Madras, the work of these societies is confined to the Nilgiri Hills. They are primary credit societies with the Nilgiri District Potato and Agricultural Producers' Crop Sale Society at Mettupalaiyam at their head. Seventy-two co-operative credit societies and a few individual big growers are members of this central sale society. The central society, besides arranging for the sale of the produce, also purchases manure on cash or credit basis and passes it on to the primary societies for distribution to growers.

In Bombay, there is only one co-operative sale society, which deals with potatoes, *viz.*, the Belgaum Gardeners' Co-operative Production, Supply and Sale Society. This society advances loans to the members against property or on the security of other members, procures seeds and manures for them and sells their produce on a commission basis. The society also sells the produce of non-members.

In Sind, the Malir Co-operative Sale Society, Ltd., now defunct, used to advance loans to potato growers who were members of the society at  $6\frac{1}{2}$  per cent. Membership was confined to the residents of the Karachi *taluka* and was restricted to the agricultural classes only. Besides advancing loans for seed and manure, it also acted as a selling agency for the potato crop of its members.

In the Central Provinces, no special societies of potato growers exist, but there is a number of agricultural associations which help potato growers in several ways. In 1935, the Sohagpur Agricultural Association deputed an agricultural assistant to Simla who purchased good seed potatoes and got them carefully packed and sent to Sohagpur for distribution to members. The Association advanced the money for the

purchase and other incidental expenses. This amount was recovered from growers and on the whole a saving of 50 per cent in the price was effected by direct purchase of the seed at the exporting centre.

In the United Provinces, there are no potato growers' associations except the co-operative societies recently started in some villages near Bhowali and Garmpani in the district of Nainital. The primary object of these societies is to enable farmers to obtain a fair price for their produce, to ensure the supply of well graded products to purchasers and to check fraudulent methods practised by the various agencies.

It is thus evident that potato growers have very few organised associations of their own. There is room for the development of a number of associations in the more important areas. These associations should be formed on a co-operative basis. The working capital should be obtained by shares subscribed to by members and by getting loans from banks. The associations should advance money to members to enable them to meet their initial expenses in production and may also provide them with seed and manure. This would enable members to obtain good quality of seed and manure and also to make purchases at cheaper rates. These associations may also take up the task of selling the produce of their members and thus ensure that they get a legitimate share in the ultimate price of the commodity. They may also undertake grading and standardisation of the produce. The success of such co-operative marketing societies is largely, if not entirely, dependent upon the ability and honesty of those entrusted with their working and upon the loyalty of the members of the society.

In India, there are no potato traders' associations in the true sense of the term. There is one association at Karachi called the Fruits and Vegetables Merchants' Association, but this is an unregistered body without any rules and regulations. In case any merchant does not take delivery of goods, delays in making the payment, proves a defaulter or is otherwise undesirable, he is boycotted. Petty disputes among the members are settled by this association and thus litigation is avoided. Grievances against the railway, municipality, etc., are also ventilated through this association. But this association takes no direct part in the distribution of the potato trade.

In Assam, the potato trade is in the hands of a few wholesalers who are generally Marwaris. Although no regular association exists, there is a sort of understanding among these merchants. They occupy an almost monopolistic position

in this trade and can dictate the price at which they would purchase the commodity. Growers have no alternative but to accept the terms offered by them.

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In Burma, exporters have an association. This association is organised in order to regulate exports to India. The B. I. S. N. Co. have recognised it and the produce of its members alone is accepted for shipment to India. The quantity of the produce that each member can export is determined on the basis of the business done by him during the previous years.

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## CHAPTER XIII.—RESEARCH.

There are few institutions in India devoted exclusively to research on potatoes. The research institution at Pusa with its sub-station at Simla, and the Agricultural Research Station at Nanjanad in Madras are the main institutions where potato research has been properly conducted.

The Simla sub-station is breeding new varieties suitable for Indian requirements and special attention is being paid to the question of resistance to disease. Endeavour is also being made to maintain virus-free foundation stocks of the more important commercial varieties.

The main object of the research work carried out at the Nanjanad institution is to evolve true seed varieties which will be more compatible with Indian conditions than the imported ones. Besides this, several other lines of research have been undertaken, the important items of which are manurial trials, experiments on size of seed tubers, spacing, etc. The Agricultural Departments of various provinces and States have taken up research work on potatoes, but they have not so far been able to devote special attention to this subject. The agricultural farms have been selected as the venue of research and the experimental work has been mainly concentrated on the introduction and development of varieties suitable to local conditions. Experiments on manure and other allied problems have also been carried out. The information given below, which has mostly been compiled by Dr. B. P. Pal, Imperial Economic Botanist, describes the research carried out in some of the important provinces.

*United Provinces.*—In the United Provinces, research work has been carried out on varietal and manurial trials, storage, disease control, etc. In varietal trials, the different types grown in the province were sorted out and tested for yield and resistance to disease. Special attention was given to the control of the mosaic disease of potatoes and some success has been achieved in this direction. After rouging mosaic plants for three successive years, the crop which originally had about 70 per cent infection, both on the Farrukhabad farm (U.P.) and elsewhere, was free from the disease. Two strains of potato which have been isolated by the department promise to be better in yield and quality besides being resistant to mosaic.

Regarding manurial experiments, a mixture of castor cake with a moderate amount of litter appeared to give good results.

Storage experiments have also been carried out in the province. A cold storage experiment was also carried out by partial insulation of a godown supplied with internal refrigeration. The temperature of the godown was brought down to 55°F. and the potatoes stored in the godown suffered a loss of less than 0.4 per cent at a time when the loss in the control lot was 84.0 per cent. The results of these experiments have proved that it is possible to store the potatoes during the hot weather without much loss.

The United Provinces Government have recently sanctioned a special grant for introducing suitable varieties of foreign potatoes in the hills for multiplication with a view ultimately to supply seed potatoes to the plains. About 1,000 maunds of *Dunbar Cavalier* and *Majestic* were purchased through the

Department of Agriculture, Scotland, and distributed in the districts of Nainital, Almora and Garhwal. The varieties have generally behaved well in these districts. Besides the above two varieties a few others were also obtained from the same source and planted for trial at Bhowali.

*Bihar.*—In Bihar, the experiments have been mostly confined to manurial trials. The results have indicated that a light dressing of superphosphate in the drills at the time of planting hastens germination and gives a uniform stand and that sulphate of ammonia can profitably replace much of the castor cake used by the cultivators.

*Bengal.*—Very little research work has been done in Bengal. At Kalimpong and Rangamati farms, the *Great Scot* variety was tried but it was not found to be successful and its cultivation has been discontinued. Seedling potatoes grown at Kalimpong showed signs of great promise. The storage experiments with the white local variety showed that it could best be preserved in a cool, ventilated house without any special treatment.

*Madras.*—A good deal of work has been carried out at Nanjanad on the introduction of foreign varieties, varietal trials, experiments on manures, spacing, cultivation, breeding, etc.

In varietal trials, varieties from England and Australia, local varieties and also varieties raised from true seed, were under comparison. The Australian varieties proved to be the heaviest croppers, but as the size of the tubers in these varieties is rather large and the eyes are deep, they were not considered suitable for the Indian market.

Breeding was started in recent years with a view to producing new varieties suitable for various parts of India by the raising and testing of seedlings and the production of hybrids as well as by the acclimatisation and testing of improved varieties. The characters especially kept in view in breeding include early maturity, resistance to diseases, draught and frost and good keeping quality. A large number of crosses were made, some of which were successful.

The latest reports show that out of a large number of hybrid cultures some were under row-yield-tests and others under multiplication plots. After harvest, 19 of the most promising cultures were selected for comparative trials with *Great Scot* as control. Three of these new cultures gave significantly better results than the control.

The hill selections have been maintained pure. Many of these were under trial in the main and second crop seasons with *Great Scot* as control but none of them did better than the control.

With regard to the suitability of different manures for potato, the results of certain experiments indicate that fish guano is an excellent substitute for cattle manure. Heavy dressing of farm-yard manure and deep cultivation have been found essential for a bumper crop. The application of concentrates consisting of superphosphate, sulphate of ammonia, bone meal and sulphate of potash in addition to groundnut cake is also found to be useful.

The results of the recent manurial trials showed that the phosphatic series gave good results and that the effect of lime was beneficial. The earliest potatoes to mature were from the phosphatic series. Potash was found not only to increase the yield but also to give the potatoes resisting power against "early blight".

It was found that tubers weighing  $1\frac{1}{2}$  to 2 oz. and sown at six to nine inches apart give the most economical results.

The experiments carried out to determine the suitability of shallow versus deep ridging showed that the former, in addition to being more economical, gave 20 per cent more yield than the latter.

Experiments are in progress on manurial trials, irrigation, comparison of new versus old seed for planting, planting whole versus cut sets, spraying against *Alternaria*, etc.

A beetle of the genus *Gonocephalum* which caused considerable damage to the crop in Madras was kept in check by poison baits. Proper earthing-up is indicated to be the remedy against the caterpillar of the potato moth, as only tubers near the surface of the soil are found to be affected.

*Punjab*.—In the Punjab, work has been carried out on the introduction of foreign potato varieties and their performances as compared with the *desi* varieties on storage, hybridization and disease control.

In the varietal trials, the *Scotch* potatoes did well in the Simla Hills and their average yield was more than the *desi* varieties by about 4,000 lb. per acre. In the Murree Hills, the *Factor* variety is giving good yields in recent years.

Experiments on cross-breeding were successfully carried out and some seedling varieties were also tried. Of the imported *Scotch* varieties, five produced viable pollen. These were used as parents in hybridization work with a view to evolving superior varieties for the Punjab conditions.

Regarding the work on breeding for disease resistance, it was observed in 1927 that practically all the varieties under trial in the Punjab were affected with "mosaic" or "leaf roll." Attempts have since been made to evolve disease-resistant strains.

Recent work has been mainly directed towards ascertaining whether the Kangra Valley can be used as a centre for potato seed supply for the plains. This work if successful would make it unnecessary for the Punjab to import seed potatoes from outside the province, and would thereby reduce the cost of production of this crop.

Experiments on storage were carried out at Sialkot and Lyallpur. At the latter place, the effect of underground storage in reducing losses from diseases was being tested.

*Assam*.—A good deal of work on varietal trials, manurial experiments, storage and control of diseases has been carried out, mostly at the Upper Shillong Farm.

In varietal trials, the foreign varieties, *King of Potatoes*, *Windsor Castle*, *Imperator*, *Arran Chief* and *British Queen* have proved superior to the local varieties in yield. The results of the extensive trials indicate, however, that the new improved varieties give higher yields in the first 2 or 3 years, but they degenerate thereafter. The manurial experiments indicate that potatoes cannot be successfully grown without an adequate application of cowdung and rape cake. Consistently better results were given by an application of 200 lb. of nicifos *plus* 200 lb. of ammonium sulphate. Experiments were carried out in order to find out the effect of (1) varying quantities of farm-yard manure and compost and (2) varying combinations of artificial fertilizers with a basic dressing of 100 maunds of farm manure per acre. The results have clearly shown that 300 maunds of farm-yard manure per acre is the most economical and productive dressing and that the effect of compost is almost equal to that of farm-yard manure.

In storage experiments, the results of storing summer seed in boxes were satisfactory. In the case of underground storage although encouraging results were obtained in the beginning, it was ultimately found to be unsatisfactory.

Records of driage and rotting of potatoes from season to season are kept at the Upper Shillong Experiment Station. The latest available figures show that driage is 4.03 per cent and rotting 7.4 per cent, the variation for four years being 4.03 to 6.65 per cent for driage and 3.95 to 7.4 per cent for rotting.

The fumigation and spraying experiments for controlling the "late blight" showed that tubers treated with corrosive sublimate and fumigated with petrol are least affected by the disease and that Burgundy and Bordeaux resin mixtures are also effective sprays.

*Central Provinces.*—The Government Experimental Farm at Chhindwara is the only place in the province where some research work on potato was conducted. The work consisted of trials on varieties, manure, time of planting and storage under different conditions. Amongst the varieties under trial, the *Patna* variety gave good results during the quinquennium ending 1934-35. From the three years' results of the succeeding quinquennium, however, it is seen that *Darjeeling*, a newly introduced variety, has proved superior to *Patna* which stands second.

In the manurial trials, a dose of 16,000 lb. of farm-yard manure per acre as basal dressing followed by 220 lb. of nicifos II and 100 lb. of sulphate of potash per acre as top dressing has given the best results during the quinquennium ending 1934-35. The results of the experiments conducted recently, however, show that a dose of 17,920 lb. of cattle dung manure as a basal dressing followed by 150 lb. of cake, 225 lb. of ammonium sulphate, 260 lb. of superphosphate and 205 lb. of potassium sulphate applied in two dressings has given the highest yield. Potatoes planted in November are found to give the best yield.

The method of storing potatoes in underground pits during summer, which has been worked by the Mycologist, has given good results (for details see Chapter on "Storage").

*Bombay.*—In Bombay Province, research work has been carried out on disease and insect control, varietal trials and storage.

In the disease control experiments, special attention has been paid to the Tamera disease for which spraying or dusting the plants with a sulphur-lime preparation has been found to be an effective check. Attention has also been

given to control the ring disease, Dry Rot, Rhizoctonia blight, scale and other diseases found in the seed, and some success has been achieved in this direction. With regard to insect control, work has been done to deal with the Potato Moth with petrol fumigation.

In varietal trials, directly imported Scottish types as well as those already grown in Nilgiris have been tested for disease resistance and Majestic (among the Scottish imported varieties) has been found to be in general the highest yielder at least for the first two crops.

Regarding storage experiments, a potato storage house has been designed to keep the inside temperature between 80° and 85° F when the outside temperature is above 100°F. The store room has double walls with air space between them and a verandah on the south. The roof is of tiles but underneath this is a ceiling covered with earth to a depth of 4 inches. The ceiling is open all round the edge and is pierced by several openings in the centre. There is a chimney in the roof through which there is a continual draught in the hot weather. During the hotter part of the day both doors and windows are closed and at this time aeration is obtained through holes in the floor which are connected with outside air by means of drain pipes partially filled with water. Skeleton shelves can be built in the store room which will allow 2 layers of bags of potatoes to be stored without in any way interfering with the aeration of either layer. The store room has been found to prevent a great deal of rotting of potatoes and it has been a distinct success in Poona.

The optimum conditions for storage of potatoes have also been studied. It has been found that the loss is almost negligible if potatoes are stored at temperatures between 36°F and 40°F.

*North-West Frontier Province.*—Varietal trials at Parachinar showed *British Queen*, *Great Scot*, *Arran Chief* and *Eclipse* to be the best varieties. Yields of about 200 maunds per acre were obtained but the seed deteriorated rapidly.

An experiment in underground storage, using lime and sand reduced the loss by 25 per cent. Search is being made for a hard-skinned early variety as it is supposed to be the best for seed purposes.

*Kashmir.*—Varietal trials were carried out on foreign acclimatised and local varieties. *Scotch No. 1* gave the highest yield. All the varieties were white-skinned and did not appeal to the *zamindars* who prefer red-skinned types, as they are considered to keep well in storage and to stand transit better than the white-skinned varieties.

Taking India as a whole it seems advisable that the main object of research should be to produce a white-skinned potato with a firm (white or yellow) flesh, preferably round, of good keeping quality, capable of being transported over long distances, with short growing seasons and short period of dormancy, disease-resistant and capable of giving high yields under local conditions.

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## INTER-CHAPTER THIRTEEN.

Until a few years ago, very little attention had been paid to potato research. Recently, however, there has been a welcome change and, under the aegis of the Imperial Council of Agricultural Research, the work of potato research has been considerably stimulated.

India has a vast area of agricultural land suitable for the production of potatoes, but in spite of such potentialities its annual production is very low and wastage due to disease and other factors is high. Problems relating to the nature and quantity of seed requirements under different soil and climatic conditions, improvement in yield and prevention of diseases and loss during storage should form important items in the programme of research work.

Great confusion exists with regard to the names of different varieties of potatoes grown in India. As a first step, therefore, classification and description of existing varieties should be commenced before any attempt is made to conduct cross breeding. The main object of potato breeding should be the improvement of its yield, which is by no means a simple affair.

The reduction in the yield, under normal conditions, is mostly due to one or other of the various diseases to which potato plant is susceptible. In the hills, where the potato, a plant of temperate climate, is extensively cultivated, the crop is liable to be destroyed by the "late blight". In the plains, the crop is generally free from this disease as the high summer temperature kills the fungus. If, however, potatoes are imported from the hills late in the year and sown when lower temperature prevails, epidemics of "late blight" may occur. It is, therefore, desirable to get the seed potatoes from the hills as much in advance of the planting season in the plains as possible. "Early blight" is common both in the hills and the plains. Virus diseases, especially those of the leaf roll and mosaic types, are common both in the hills and the plains but are reported to do greater damage in the plains, particularly in those areas where the seed is not renewed frequently from outside. Wilt disease and ring disease (*Bacterium solanacearum*) also cause a considerable amount of damage in certain areas. Insect pests such as cut worms (species of *Agrotis*, etc.), and the larvæ of the epilachna beetle also cause considerable damage to the growing crops. Besides these two, there is the potato moth (*Phthorimea operculella*) which causes the greatest damage. This insect attacks

tubers both in the field and in the store and the damage caused by it is enormous.

Apart from the damage due to diseases and insect pests, considerable loss is sustained in storage on account of the rotting of tubers during the summer months. The problem of storage has lately received some attention in some of the provinces and States, but it cannot be said to have been satisfactorily solved. Storing at a low temperature is the most successful method of minimising loss in storage. Loss could also be considerably reduced if varieties capable of withstanding high temperatures were evolved.

Frost is another serious menace to the potato crop in India, specially in North-Western India. No artificial remedy for such a natural phenomenon is possible except the creation and introduction of varieties which would resist frost or would ripen before frost occurs.

In some parts of India, two crops are taken in a year but the potatoes harvested in one season cannot be used for planting in the next crop, as, after harvest, tubers usually remain dormant for two to three months and in the case of certain varieties even longer. The seed tubers have to be stored during the period of dormancy and, storage conditions being unsuitable, a fairly large proportion rots. It is, therefore, highly desirable to introduce varieties which would have short dormancy periods.

The most regrettable feature of the potato crop in India is its abnormally low yield as compared with that in other parts of the world. This is largely due to the poor quality of the seed, high incidence of diseases, inadequate manuring and the absence of varieties suitable for local conditions.

The most important problem in the production of the potato crop is that of the introduction of suitable varieties or the selection of suitable strains of varieties such as *Phulwa* which have become acclimatised and proved highly suitable for Indian conditions.

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## NOTE OF SUGGESTIONS AND RECOMMENDATIONS.

(1) Provinces and States should maintain separate records of the acreage and production of potatoes. (Page 3).

(2) All doubts about the identity of the different varieties of potatoes should be cleared up. (Page 10).

(3) Yield determinations should be made regularly by conducting crop-lifting experiments. (Page 16).

(4) There is considerable scope for more research work on the improvement of quality and yield and for the organization of seed supplies and credit to the cultivators for the purchase of seed, manure, etc. (Page 18).

(5) Large imports of potatoes indicate the scope for increasing the area under potatoes, particularly in the hills. (Page 29).

(6) New varieties should be introduced to replace the Italian varieties, which are at present obtained from Italy for being grown mostly in Bombay and Sind. (Pages 29 and 30).

(7) The import figures for farina indicate the possibilities of starting a farina industry in this country. This and other products, *e.g.*, alcohol, dextrin, glucose, etc., could only be manufactured if the yield of potatoes was increased and their cost of production reduced. (Page 46).

(8) More regular records should be maintained of both wholesale and retail prices in the principal assembling and consuming markets in India. (Pages 57 and 68).

(9) The standardisation of weights is an urgent necessity for improving agricultural marketing. The passing of the Standards of Weight Act (1939) makes uniform progress possible and the provinces and States should take the necessary active measures as soon as possible. (Pages 72 and 73).

(10) A separate organisation should be set up to collect market information about agricultural commodities including potatoes and to disseminate it through the press, the radio and other agencies. (Page 76).

(11) Damage during harvest should be reduced by (i) introducing improved methods of harvesting, (ii) using improved implements and (iii) planting potatoes in straight rows, say two feet apart. (Page 86).



(12) With a view to avoid damage and subsequent deterioration in quality the transport of potatoes loose in carts by the cultivators should be discouraged. (Page 88).

(13) The grading of potatoes both for seed and table purposes according to definite qualities, sizes, shapes, colour, etc., is absolutely essential. The Agricultural Produce (Grading and Marking) Act, 1937, provides for a voluntary system of grading and should be taken advantage of by all concerned. The standardisation of packages is also very important. In order to avoid disputes, the weight of the contents of a bag should be fixed and the actual weight of potatoes at the time of packing be marked on it. (Pages 101 and 102).

(14) The market practices should be standardised and the market charges fixed. The Market Acts may be applied to the potato markets wherever they exist, particularly in the provinces where potato is an important crop. In the absence of a Market Act, a system of registration of markets should be introduced. The commission agents doing business in such markets should be required to take out a licence and to deposit a security, which could be utilised towards the payment of dues from consignments sold, in case of default. (Page 123).

(15) The method of storing potatoes in pits devised by the Department of Agriculture, Central Provinces, should be tried elsewhere. (Page 140).

(16) The high losses which occur in the storage of potatoes in the plains during summer months are mainly due to high temperatures and can be minimised by taking advantage of cold storage facilities. (Pages 149-150).

(17) Where areas of production are not directly connected by rail with assembling centres, *e.g.*, between Assam and Calcutta, the transport of the produce should not be made the monopoly of any one concern. Alternatively, lower rates should be fixed by Government. (Page 175).

(18) Wooden vans should be introduced for the transport of potatoes during summer instead of the steel wagons which now exist. (Page 177).

(19) Additional facilities should be provided for storing and marketing potatoes at the terminal stations. (Page 177).

(20) The general rate for the transport of potatoes by passenger and parcel trains is very high and should be reduced. (Page 177).

(21) To encourage direct sales in consuming markets, the purchase by the commission agents themselves of the produce sent to them for sale on a commission basis should be made illegal and the rate of commission fixed by government. (Page 190).

(22) The formation of co-operative sale societies for the purpose of distribution both in the producing and consuming areas should be given every encouragement. (Page 192).

(23) Market conditions should be studied more carefully by the municipal authorities and the prices published daily and not weekly or fortnightly as it is the case in most markets at present. Moreover, the municipal authorities should exercise a more effective control over the markets under their jurisdiction with a view to checking malpractices and enforcing standard weights. (Page 196).

(24) The cost of distribution should be reduced by eliminating intermediaries as far as possible, and by establishing more direct contact between producing and consuming centres. (Page 199).

(25) Experiments should be undertaken in different potato producing areas so that the cultivators may know the most economical size of seed potatoes as well as the distance between rows and sets in the row. (Page 206).

(26) Exchange of seed between adjoining territories such as Sind and Baluchistan where the periods of raising the crop are different should be organised. (Page 214).

(27) Growers' organisations should be formed for the distribution of seed so that members may be saved the trouble and expense of visiting the exporting centres individually. (Page 218).

(28) In order to make available stocks of seed potatoes which would be true to variety and at the same time free from diseases, a system of seed certification on the lines of the one working in the United States of America or United Kingdom should be introduced. The names of the cultivators who are willing to participate in the scheme should be registered with a government department and they should be supplied with pure stocks of different varieties. (Page 225).

(29) Potato growers' co-operative societies should be started in the various producing areas to look after the financial and other requirements of the members. (Page 239).

(30) The main object of research should be to produce a white-skinned potato with firm flesh—preferably round—of good keeping quality capable of being transported over long distances, with short growing seasons and short period of dormancy, disease resistant and capable of giving high yields under local conditions. (Page 254).

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## APPENDICES.

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## APPENDIX I.

*Area and production of potatoes in the chief producing countries of the world.*

	Area. (In thousand acres).						Production. (In million maunds).					
	1933.	1934.	1935.	1936.	1937.	1938.	1933.	1934.	1935.	1936.	1937.	1938.
Europe—												
Germany * . . . .	7,191	7,235	6,845	6,902	7,137	7,149	1,188	1,263	1,107	1,241	1,482	1,304
Austria . . . . .	504	499	499	519	534	531	63	74	64	63	97	87
Belgium . . . . .	403	395	403	395	390	363	99	87	81	86	83	87
Spain . . . . .	1,072	1,171	1,137	..	..	..	131	137	136	..	..	..
France . . . . .	3,437	3,484	3,489	3,514	3,548	3,521	397	446	384	409	425	464
Hungary† . . . . .	727	717	756	734	729	710	50	57	44	66	69	57
Italy . . . . .	986	988	1,003	1,053	1,013	1,033	64	73	58	71	86	79
Poland . . . . .	6,771	6,825	6,998	7,140	7,364	7,487	759	897	871	919	1,078	926

Rumania†	706	714	734	776	776	702	41	55	54	57	57	49
United Kingdom	811	766	724	722	717	734	150	147	127	125	134	139
Lithuania	442	440	435	450	455	460	49	65	48	57	67	57
Czechoslovakia	1,819	1,846	1,851	1,871	1,908	1,885	220	257	206	287	331	263
Others	2,807	2,843	2,778	3,962	3,792	3,987	451	453	420	574	563	581
Total Europe	27,676	27,923	27,652	28,047	28,393	28,591	3,662	4,011	3,600	3,955	4,472	4,153
Union of Soviet Socialist Republics.	13,977	15,148	18,227	18,724	18,303	..	1,320	1,367	1,869	1,751§	1,711§	..
AMERICA—												
Canada	529	568	507	502	531	521	52	58	47	48	52	44
United States	3,413	3,598	3,541	3,062	3,173	3,007	250	296	282	242	287	269
Others	703	801	722	637	769	253	59	53	43	43	60	11
Total America	4,645	4,967	4,770	4,201	4,473	3,781	361	407	372	333	399	324

\* Including the Saar territory; in the average, an estimate has been adopted for this territory.

† Figures represent the area under the main and garden crops.

‡ Figures represent the area under the mixed and unmixed crops.

§ Estimated figures.

## APPENDIX I—contd.

*Area and production of potatoes in the chief producing countries of the world—contd.*

	Area. (In thousand acres.)						Production. (In million maunds.)					
	1933.	1934.	1935.	1936.	1937.	1938.	1933.	1934.	1935.	1936.	1937.	1938.
ASIA . . . . .	734	808	798	872	917	914		56	57	75	86	84
AFRICA . . . . .	208	218	220	223	227	59*	11	12	13	13	13	14
OCEANIA . . . . .	166	153	148	153	136	..	12	11	12	16	13	..
Grand total .	47,406	49,217	51,815	52,220	52,449	34,175†	5,426	5,864	5,923	6,143	6,694	4,638†

\* Figure relates to Northern Hemisphere only.

† Excluding Union of Soviet Socialist Republics.

## APPENDIX II.

*Exports and imports of potatoes from and into the principal countries of the world.*

(In thousand maunds.)

—	1933.	1934.	1935.	1936.	1937.	Average quan- tity.	Percent- age.
Imports into :—							
Germany . . .	1,910	2,996	1,612	2,190	3,806	2,503	7·9
Belgo-Luxemburg	3,197	2,413	2,165	2,194	2,404	2,475	7·8
France. . . .	2,575	3,262	2,788	4,214	4,304	3,429	10·9
Italy . . . .	838	2,352	2,039	1,564	2,099	1,778	5·6
Netherlands . .	248	254	181	129	145	191	0·6
United Kingdom .	5,347	4,199	5,194	8,613	6,052	5,881	18·6
Canada . . . .	132	151	129	161	184	151	0·5
Argentina . . .	289	5	23	3,507	6,497	2,064	6·6
Others . . . .	12,433	13,526	12,771	13,307	13,458	13,100	41·5
Total (World) .	26,969	29,158	26,902	35,879	38,949	31,572	100·0
Exports from :—							
Germany . . . .	918	1,036	458	474	572	692	2·0
Belgo-Luxemburg	852	981	926	2,072	2,309	1,428	4·2
France. . . .	1,734	2,490	1,799	1,800	1,475	1,860	5·5
Italy . . . .	3,099	3,070	2,058	2,323	4,177	2,945	8·7
United Kingdom .	1,154	1,301	1,078	872	1,517	1,184	3·5
Netherlands . .	6,865	6,280	5,466	10,405	12,423	8,288	24·4
Argentina . . .	870	842	923	85	107	565	1·7
Canada . . . .	1,404	1,707	1,025	1,652	2,376	1,633	4·8
Others . . . .	11,268	12,588	14,836	17,696	20,381	15,354	45·2
Total (World) .	28,164	30,295	28,569	37,379	45,337	33,949	100·0



## APPENDIX III.

*Statement showing the seasons of planting and harvesting of potatoes in the important potato producing provinces and States.*

Name of province or State.	Crop.	Plains.		Hills.	
		Season of planting.	Season of harvesting.	Season of planting.	Season of harvesting.
United Provinces	Summer crop .	Sept. to Nov.	Dec. to April	Mid. Feb. to End April	July to Oct.
	Winter crop .	...	...	...	...
Bihar . .	Summer crop .	Mid. Sept.	Mid Nov.	...	...
	Winter crop .	End Nov.	Mid March	...	...
Bengal . .	Summer crop .	Oct. to Dec.	Nov. ...	Feb. to March .	July to Aug.
	Winter crop .	...	Beg. March.	Sept. to Oct. .	Feb. to March.
Assam . .	Summer crop .	Sept. to Oct.	Dec. to Jan.	February .	June to Sept.
	Winter crop .	...	...	August .	Nov. to Dec.
Bombay . .	Summer crop .	June to July	Sept. to Oct.	Mid. Feb.	May.
	Winter crop .	Oct. to Nov.	Jan. to Beg. Mar.	...	...
Madras . .	Summer crop .	...	...	March to April	June to Aug.
	Winter crop .	...	...	Aug. to Sept. .	Dec. to Jan.
Punjab . .	Summer crop .	January .	Mid. April	Mid. March .	Mid. Aug.
	Winter crop .	...	End May.	End Apl. to Jan.	Mid. Oct. (H. A.)
	Winter crop .	Mid Sept.	End Nov.	...	June (L. A.)
	Winter crop .	...	End Feb.	...	...
Sind . .	Summer crop .	Beg. Jan.	April to May	...	...
	Winter crop .	End Jan.	...	...	...
	Winter crop .	Sept. to Oct.	Dec. to Feb.	...	...
Central Provinces and Berar.	Summer crop .	...	...	End June	End Sept.
	Winter crop .	Oct. to Jan.	Jan. to March	...	Beg. Oct.
North-West Frontier Province	Summer crop .	Jan. to Feb.	May to June	March to April	Sept. to Oct.
	Winter crop .	September.	Dec. to Jan.	...	...
Mysore . .	Summer crop .	May to June	Aug. to Sept.	...	...
	Winter crop .	Oct. to Nov.	Jan. to Feb.	...	...
Patiala . .	Summer crop .	End Jan..	Beg. April	Mid. March .	Mid. Aug.
	Winter crop .	...	End May	End April	Mid. Oct.
	Winter crop .	Mid. Sept. to Oct.	Mid. Nov.	Dec. to Jan.	June to July.
	Winter crop .	...	Mid. Jan.	...	...
Orissa . .	Summer crop .	...	...	...	...
	Winter crop .	October .	Mid. Jan.	...	...
	Winter crop .	...	Mid. March.	...	...
Hyderabad .	Summer crop .	...	...	...	...
	Winter crop .	Mid. Oct. to Dec.	End Dec. to March.	...	...
Travancore .	Summer crop .	...	...	Feb. to March .	July to Aug.
	Winter crop .	Oct. to Dec.	Feb. ...	...	...
	Winter crop .	...	Beg. March.	...	...
Coorg . .	Summer crop .	May	Beg. Sept.	...	...
	Winter crop .	Mid. Sept.	End. Dec.	...	...
Kashmir . .	Summer crop .	January .	April	June .	September.
	Winter crop .	Mid. Sept.	January .	...	...
	Winter crop .	Beg. Oct.	...	...	...
Baroda . .	Summer crop .	...	...	...	...
	Winter crop .	Mid. Nov.	Mid. Jan.	...	...
	Winter crop .	Beg. Dec.	End April	...	...
Gwallor . .	Summer crop .	...	...	...	...
	Winter crop .	Sept. to Jan.	Nov. to April	...	...

H. A.—High altitude.  
L. A.—Low altitude.

## APPENDIX IV.

*Description of main types of potatoes.***Variety No. 1. (Type—*Phulwa*).***Tubers—*

Skin . . .	White.
Shape . . .	Round.
Eyes . . .	Medium deep, eyes often picked out with red. Eyebrows slightly developed.
Flesh . . .	Yellow.

The most common names for this variety are *Phulwa* and *Patna White*, but it appears to pass also under the following names :—

*Bilaiti, Bhutani, Biju, Bon Alu, Comill, Desi, Colgong Alu, Darjeeling White Round, Desi Darjeeling, Desi-Patna, White Local, Deswali, Farrukhabadi, Jullunduri, Nawabganj, Pahari Ujari, Patna Sufeda, Rangamis, Ranu Local, Rangpuria, Safeda, Sona Mukhi, Tikra.*

Samples of this variety have been received from Assam, Bengal, Bihar, the Central Provinces, the Punjab and the United Provinces.

**Variety No. 2. (Type—*Darjeeling Red*).***Tubers—*

Skin . . .	Light red, rough (young tubers have smooth skin).
Shape . . .	Round, irregular.
Eyes . . .	Deep, eyebrows occasionally prominent.
Flesh . . .	Yellow.

The most common name of this variety is *Darjeeling Red*, other names being as follows :—

*Amarjhanti, Bahraich Red, Bhiranja, Bhutia Cawnpore, Darjeeling Red Round, Desi Red (Lalka), Forbesganji, Jharia (Dohara), Jhaboria, Jhabri, Jhitori, Kahalgara (Ali Betia), Kachchoo, Kanpuria, Katuwa, Labani, Patna Red, Paharia, Petari.*

Samples of this variety have been obtained from Assam, Bengal, Bihar, the Central Provinces, the Punjab and the United Provinces.

**Variety No. 3.***Tubers—*

Skin . . .	Red.
Shape . . .	Round to oval, very irregular, sometimes constricted.
Eyes . . .	Medium deep to deep, eyebrows prominent.
Flesh . . .	White.

The varieties received under the names *Assamia, Bilaiti, Daisila, Dashila, Lalka, Desi Red, Gohama, Hagra, Hilora, Lalki, Lalwa, Local Red, Patjiraba, Patnai Red, Shikilati* and *Sweet Lalli* appear to belong to this variety.

Samples of this variety have been received from Assam, Bengal and Bihar.

## APPENDIX

*Trend of estimated acreage  
(1930-31 to*

Names of provinces or States.	1930-31	1931-32	1932-33	1933-34	1934-35
<b>(1) INDIA.</b>					
United Provinces . . . .	162,000	162,000	162,000	162,000	172,400
Bihar . . . . .	90,000	90,000	90,000	90,000	90,000
Bengal . . . . .	60,500	60,500	60,600	63,800	65,900
Assam . . . . .	31,800	31,700	31,400	31,400	31,700
Bombay . . . . .	19,800	21,000	24,200	21,700	23,100
Madras . . . . .	10,600	10,200	10,900	12,400	13,600
Punjab . . . . .	9,600	10,700	12,100	11,800	11,600
Mysore . . . . .	3,400	3,500	4,300	4,400	6,300
North-West Frontier Province . . . . .	2,600	2,600	3,400	2,300	2,100
Central Provinces . . . . .	2,500	2,500	2,800	3,000	3,300
Sind . . . . .	3,600	4,900	6,600	6,700	6,400
Patiala . . . . .	2,700	1,800	1,900	1,700	1,800
Orissa . . . . .	1,900	1,900	1,900	1,900	1,900
Gwalior . . . . .	1,500	1,100	1,450	1,760	1,600
Baroda . . . . .	850	900	950	800	800
Hyderabad . . . . .	400	400	400	400	400
Other provinces and States* . . . . .	15,500	15,500	15,500	15,500	15,500
<b>Total for India . . . . .</b>	<b>419,250</b>	<b>421,200</b>	<b>430,400</b>	<b>431,560</b>	<b>448,400</b>
<b>(2) BURMA.†</b>					
Shan States . . . . .	19,700	20,500	25,300	27,900	19,000
Burma proper . . . . .	3,700	3,300	3,500	3,500	3,300
<b>Total for Burma . . . . .</b>	<b>23,400</b>	<b>23,800</b>	<b>28,800</b>	<b>31,400</b>	<b>22,300</b>

\*Estimated on the basis of the area

†Estimated on the

## V.

*under potatoes in India.*  
1938-39.)

1935-36	1936-37	1937-38	1938-39				Total.
			Plains.		Hills.		
			Summer.	Winter	Summer.	Winter.	
160,300	153,900	153,800	..	157,200	11,800	..	169,000
90,000	90,000	90,000	..	90,000	..	..	90,000
70,000	79,900	83,000	..	86,400	1,000	600	88,000
31,400	31,300	31,600	..	22,000	8,600	900	31,500
22,900	21,500	21,500	13,500	9,800	100	..	23,400
13,200	13,300	15,400	..	..	10,700	4,600	15,300
11,600	11,600	11,600	2,400	8,400	800	..	11,600
5,700	6,400	5,200	2,100	3,100	..	..	5,200
4,200	4,200	4,200	400	200	3,600	..	4,200
3,700	3,400	3,300	..	3,200	300	..	3,500
4,700	2,400	3,400	700	3,300	..	..	4,000
1,800	2,500	1,700	..	200	1,300	100	1,600
1,900	2,800	3,000	..	3,500	..	..	3,500
1,550	1,200	1,200	..	1,200	..	..	1,200
700	700	900	..	800	..	..	800
400	400	400	..	400	..	..	400
15,500	15,500	15,500	640	12,656	2,062	142	15,500
439,550	441,000	445,700	19,740	402,356	40,262	6,342	468,700
24,500	29,900	30,800	2,900	..	22,600	..	25,500
3,700	3,800	4,100	..	2,500	1,600	..	4,100
28,200	33,700	34,900	2,900	2,500	24,200	..	29,600

under fruits and vegetables.  
basis of production.

## APPENDIX VI.

*List of some of the commercial varieties of potatoes grown at the Imperial Agricultural Research Institute with remarks about purity of each sample.*

Sample No.	Original name of the sample.	Locality.	Remarks about purity of the variety.
1	Simla Nainital . . .	Tarakeswar (Hooghly)	
2	Rangoon Nainital . . .	Do. . . .	Mixture of two varieties designated as (a) and (b).
3	Lal Alu . . . .	Do. . . .	
4	Do. . . .	Do. . . .	Do.
5	Bogra . . . .	Do. . . .	Do.
6	..	Malir (Karachi, Sind) .	Do.
7	..	Sukkur, Sind . . .	Do.
8	Deesa . . . .	Karachi.	
9	Pahari . . . .	Rupar.	
10	Gola . . . .	Do.	Do.
11	Katuwa . . . .	Chhindwara and Nagpur	Do.
12	Ben Cruachan . . .	Nanjanad.	
13	Great Scot . . . .	Do.	
14	Mahasu . . . .	Jullundur . . . .	Do.
15	Khira . . . .	Lahore . . . .	Mixture of six varieties designated as (a), (b), (c), (d), (e) and (f).
16	Gola Pathankot . . .	Ludhiana.	
17	Phulwa . . . .	Gwalior.	
18	Two monthly variety .	Baluchistan	
19	Karachi Wala (six monthly variety) . . . .	Do.	
20	Italian White Round .	Poona.	
21	Natu or Round . . .	Mysore.	
22	Ricket . . . .	Do.	
23	Pahari . . . .	Gwalior.	
24	Desi, Patna . . . .	Do.	
25	Italian type . . . .	Guna (Gwalior).	

APPENDIX VI—*contd.*

Sample No.	Original name of the sample.	Locality.	Remarks about purity of the variety.
26I	Lal $\frac{1}{2}$ " and below in diameter	Patna.	Mixture of two varieties designated as (a) and (b).
26II	Lal $5/8$ " diameter . . .	Do.	
26III	Lal $6/8$ " diameter . . .	Do.	
26IV	Lal $7/8$ " diameter . . .	Do.	
26V	Lal 1" diameter . . .	Do.	
27I	Phulwa (white) $\frac{1}{2}$ " and below diameter.	Do.	
27II	Phulwa (white) $5/8$ " diameter . . .	Do.	
27III	Phulwa $6/8$ " diameter . . .	Do.	
27IV	Phulwa $7/8$ " . . .	Do.	
27V	Phulwa 1" . . .	Do.	
28I	Satha or Asla (white) $\frac{1}{2}$ " and below diameter . . .	Do.	
28II	Satha or Asla (white) $5/8$ " diameter . . .	Do.	
28III	Satha or Asla (white) $6/8$ " diameter . . .	Do.	
28IV	Satha or Asla (white) $7/8$ " diameter . . .	Do.	
28V	Satha or Asla (white) 1" diameter . . .	Do.	
29	Three monthly variety . . .	Baluchistan	
30	.. . . .	Kondmal (Orissa).	
31	Up-to-date . . . . .	Kashmir	
32	Inverness Favourite . . . . .	Do.	
33	Kashmiri . . . . .	Do.	
34	Arran Banner . . . . .	Do.	
35	Murree White . . . . .	Do.	
36	Karachi . . . . .	Assam.	
37	Garwali . . . . .	Haldwani, U. P.	
38	Epicure . . . . .	Shillong.	
39	Arran Consul . . . . .	Do.	
40	Factor . . . . .	Do.	
41	Great Scot . . . . .	Do.	

APPENDIX VI—*contd.*

Sample No.	Original name of the sample.	Locality.	Remarks about purity of the variety.
42	Talisman . . . .	Shillong.	
43	Darjeeling . . . .	Do.	
44	Up-to-date . . . .	Do.	
45	Inverness Favourite . .	Do.	
46	Arran Banner . . . .	Do.	
47	Italian White Round . .	Do.	
48	Pahari (grown in hills) .	Dehra Dun.	
49	Pahari (grown in plains) .	Do.	
50	Gola Chonchiya . . . .	Meerut.	
51	Gola Market variety $\frac{3}{4}$ " below.	Do.	
52	Gola Market variety $\frac{3}{4}$ "— $\frac{7}{8}$ "	Do.	
53	Gola Market variety $1 \frac{1}{16}$ "— $1\frac{1}{4}$ "	Do.	
54	Gola Market variety $1\frac{1}{4}$ "— $1 \frac{3}{8}$ " . . . .	Do.	
55	Phulwa Dehra Dun seed acclimatised at Meerut .	Do. . . . .	Mixture of two varieties designated as (a) and (b).
56	Tomri seed from Solan acclimatised at Meerut .	Do.	Do.
57	Patna White (best quality) acclimatised at Meerut .	Do.	
58	Patna White (ordinary quality) acclimatised at Meerut . . . .	Do.	
59	Gola stored by producer .	Do.	
60	Factor . . . . .	Palampur	
61	Kangra Local . . . .	Do.	
62	Phulwa . . . . .	Farrukhabad.	
63	Gola Kalma . . . . .	Do.	
64	Kalva . . . . .	Do. . . . .	Do.
65	Madraji . . . . .	Jaunpur.	
66	Sitbo . . . . .	Federated Shan States (Burma.)	
67	Up-to-date . . . . .	Do.	
68	Great Scot . . . . .	Do.	

APPENDIX VI—*contd.*

Sample No.	Original name of the sample.	Locality.	Remarks about purity of the variety.	
69	Ally . . . . .	Federated, Shan States (Burma.)	Mixture of two varieties designated as (a) and (b).	
70	Bengala (Hilde brands' Kidney) . . . . .	Do.		
71	Shan . . . . .	Do.		
72	Darjeeling Red Round . . . . .	Darjeeling.		
73	Darjeeling White Round . . . . .	Do.		
74	Nainital . . . . .	Do. . . . .		
75	Sarmauri . . . . .	Kanda Ghat (Patiala State).		
76	Silbilati . . . . .	Rangpur Dist. (Bengal).		
77	Pakri . . . . .	Bogra Dist. (Bengal).		
78	Sindurfuti . . . . .	Do.		
79	Patna . . . . .	Jammu		
80	White Gola . . . . .	Do.		
81	Phulia . . . . .	Patiala		
82	Gola . . . . .	Do.		
83	Batia . . . . .	Do. . . . .	Do.	
84	Simla . . . . .	Ujjain Dist. (Gwalior State).	Mixture of four varieties designated as (a), (b), (c) and (d).	
85	Deshi . . . . .	Morens Dist. (Gwalior State).		
86	Italian White Round . . . . .	Poona Dist., Bombay.		
87	Jullunduri Surkh . . . . .	Sambhal. U. P. . . . .		Do.
88	Dunbar Cavalier . . . . .	Bhimtal Dist. (Nainital)		
89	Dhamtauri . . . . .	Peshawar.		
90	Tirahi . . . . .	Do.		
91	Rangoon . . . . .	Bengal, but imported from Shan States (Burma).		
92	Gauhati (Assam) . . . . .	Bengal, imported from Assam.		
93	Simla (Nainital) . . . . .	Bengal, imported from Kalka-Simla.		
94	Italian White Round . . . . .	Tarihal village, Bombay.		
95	Do. . . . .	Ambewadi village, Bombay.		
96	Do. . . . .	Sulga village, Bombay.		



APPENDIX VI—*concl'd.*

Sample No.	Original name of the sample.	Locality.	Remarks about purity of the variety.
97	Italian White Round . . .	Japurwadi village, Bombay.	
98	Do. . . .	Kodoli village, Bombay.	
99	Satha . . . .	Farrukhabad. . .	
100	Italian White Round . .	Dharwar, Bombay.	
101	Do. . . .	Nasik, Bombay.	
102	Do. . . .	Ahmednagar, Bombay.	
103	Red Long (Kidney) . . .	Ambrala village, Dist. Satara, Bombay.	
104	Katoi (Patna Red) . . .	Shahbad, Dist. Hardoi.	
105	Desi Red . . . .	Do. . . .	
106	Desi White . . . .	Do.	
107	Long Bean . . . .	Hills in the United Provinces.	..
108	Long Keeper . . . .	Do.	Mixture of two varieties designated as (a) and (b).

# APPENDIX VII.

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\**Rough classification of varieties of potatoes grown in India according to shape and colour.*

Desi				European		Miscellaneous (unclassified)	
White Round		Coloured		White Round	White oval	White	Coloured
Phulwa type	Phulwa purple splashed round	Gola type	Coloured round (Darjeeling Red type)	Coloured oval (Siblati type)	Great Seal, Epicure, Arran Consul, Ben Cruachan, Italian White Round (Raccia).	Royal Kidney, Up-to-date, Dunbar, Long Keeper, Long Local, Nainital, Rangoon, Athly, Arran Banner, Inverness Favourite, Italian White Long.	Deesa, Nandu. Ricket, Pahari, Bengala, Dhampur.
Bogra (a), Mahasu (a), Phulwa, Desi Patna, Satha, Phulwa, Dehra Dun, Patna (a), Madraji, White, feeling, Gola, Batia (a), Deshi, Shan, Desi White, Farukhabadi, Safeda, Tikra, Bhutani, Karachi.	Bogra (b), Katta (b), Desi Red (b).	Gola ?, Domahi, Semahi, Gola hari, Gola Kalma, Batia (b), Phulwa (b), Gola Chonchiya.	Lal Alu (a), Kattina (a), Lal (a), Darjeeling, Red, Nainital (b), Pakri, Patna, Surkha, Jalandari, Surkh (a), Kato.	Siblati, Sinduruti.			

For elucidation of references (a) and (b) please see Appendix VI.

\*This classification is based on a preliminary report by Dr. Pal, Imperial Economic Botanist, representing the results of trials conducted at Delhi, where potato does not flower. A final and more complete report on the basis of further trials conducted at the Potato Breeding Sub-station, Simla, has also been received since, which has been printed separately (see Appendix XXXIII).

## APPENDIX VIII.

*Tuber characters of varieties and their synonyms with remarks about disease, etc.*

Serial No.	Variety.	Tuber characters.	Remarks about disease, etc.
1	Simla Nainital .	Size medium, shape oval, tapering towards both ends, skin colour white, surface smooth, eyes fleet, eyebrows long and marked.	
2	Rangoon (a) .	Similar to serial No. 1.	
3	Rangoon (b) .	Similar to serial No. 69.	
4	Lal Alu (a) .	Size medium, shape round, skin colour deep blue purple with occasional white patches, surface smooth sometimes rough, eyes medium deep, eyebrows slightly marked.	Poor stock.
5	Lal Alu (b) .	Similar to serial No. 68.	
6	Lal Alu (a) .	Size small, shape oval irregular with a recess at heel, skin colour blue purple towards crown half and white near base, varying in extent, surface smooth, eyes medium deep, eyebrows slightly developed.	
7	Lal Alu (b) .	Similar to serial No. 68 .	Virus infected.
8	Bogra (a) .	Similar to serial No. 29.	
9	Bogra (b) .	Size small, shape round, skin colour white with varying degree of purple splashes especially towards crown end, surface smooth, eyes medium deep, picked purple, eyebrows slightly developed.	
10	..	Similar to serial No. 32 .	Poor stock, virus infected.
11	..	Size small, shape round, skin colour white, surface smooth, eyes fleet to medium deep, eyebrows indistinct.	Do.
12	..	Similar to serial No. 32 .	Do.
13	Deesa .	Size small, shape round, skin colour white with purplish tinge, surface smooth, eyes medium deep, eyebrows slightly developed.	Do.
14	Pahari .	Size medium, shape oval tapering towards both ends, skin colour white, surface smooth, eyes fleet, eyebrows slightly marked.	Virus present.
15	Gola .	Similar to serial No. 75 ?	

APPENDIX VIII—*contd.*

Serial No.	Variety.	Tuber characters.	Remarks about disease, etc.
16	Katuwa (a) . .	Similar to serial No. 68 . .	Virus infected.
17	Katuwa (b) . .	Size small to medium, shape round to oval round, skin colour very light red with blue purple pigment at heel occasionally on crown as well, surface smooth to rough, eyes medium deep to deep, crown eyes picked purple, eyebrow slightly developed.	
18	Ben Cruachan . .	Size medium, shape round to oval round, occasionally flattened, skin colour white, surface smooth, eyes fleet, eyebrows slightly marked.	Virus infected.
19	Great Scot . .	Size medium to large, shape round occasionally slightly flattened, skin colour white, surface rough occasionally smooth, eyes medium deep, eyebrows slightly marked.	Do.
20	Mahasu (a) . .	Similar to Serial No. 29	
21	Mahasu (b) . .	Similar to Serial No. 1	
22	Khira (a) . .	Similar to Serial No. 29	
23	Khira (b) . .	Similar to Serial No. 69.	
24	Khira (c) . .	Size small to medium, shape oval, irregular, skin colour light red, surface smooth, eyes fleet, eyebrows indistinct.	
25	Khira (d) . .	Similar to Serial No. 14.	
26	Khira (e) . .	Similar to Serial No. 75 ? . .	Badly virus infected.
27	Khira (f) . .	Similar to Serial No. 33.	
28	Gola Pathankot . .	Size medium to large, shape round to oval-round, skin colour light red splashed, surface smooth, eyes fleet to medium, picked purple, eyebrows long and marked.	Poor stock, virus present.
29	Phulwa . .	Size small, shape round, skin colour white, surface smooth, eyes medium deep, often crowded at crown, picked purple especially at crown, eyebrows slightly developed.	Some plants virus infected, some healthy good stock.
30	Two monthly variety	Similar to Serial No. 75.	
31	Karachi Wala (six monthly variety.)	Similar to Serial No. 32 ? . .	Poor stock.

APPENDIX VIII—*contd.*

Serial No.	Variety.	Tuber characters.	Remarks about disease, etc.
32	Italian White Round	Size medium, shape round, irregular, skin colour white, surface smooth, eyes medium deep, eyebrows indistinct.	Poor stock.
33	Natu or Round	Size small to medium, shape round, skin colour white, surface smooth, eyes medium deep, eyebrows slightly developed.	
34	Ricket . . . .	Size medium, shape oval tapering towards both ends, skin colour white, surface smooth, eyes fleet, eyebrows indistinct.	
35	Pahari . . . .	Similar to Serial No. 14.	
36	Desi, Patna . . . .	Similar to Serial No. 29.	Virus infected.
37	Italian type . . . .	Similar to Serial No. 32. . . .	
38	Lal (a) . . . .	Similar to Serial No. 68.	
39	Lal (b) . . . .	Similar to Serial No. 29.	
40	Lal . . . .	Similar to Serial No. 68.	
41	Lal . . . .	Similar to Serial No. 68.	
42	Lal . . . .	Similar to Serial No. 68.	
43	Lal . . . .	Similar to Serial No. 68.	
44	Phulwa . . . .	Similar to Serial No. 29.	
45	Do. . . .	Similar to Serial No. 29.	
46	Do. . . .	Similar to Serial No. 29.	
47	Do. . . .	Similar to Serial No. 29. . . .	
48	Do. . . .	Similar to Serial No. 29. . . .	
49	Satha or Asla . . . .	Similar to Serial No. 29.	
50	Do. . . .	Similar to Serial No. 29.	Good seed stock.
51	Do. . . .	Similar to Serial No. 29. . . .	
52	Do. . . .	Similar to Serial No. 29. . . .	
53	Do. . . .	Similar to Serial No. 29. . . .	
54	Three monthly variety.	Similar to Serial No. 75.	Do.
55	..	Similar to Serial No. 29.	
56	Up-to-date . . . .	Similar to Serial No. 69	

APPENDIX VIII—*contd.*

Serial No.	Variety.	Tuber characters.	Remarks about disease, etc.
57	Inverness Favourite.	Size medium, shape oval, tapering towards both ends, surface smooth, occasionally rough, eyes fleet, eyebrows long and marked.	
58	Kashmiri . .	Similar to Serial No. 28. . .	Poor stock, virus infected.
59	Arran Banner. .	Size medium to large, shape oval slightly flattened, skin colour white, surface smooth, eyes fleet to medium deep, eyebrows slightly developed.	Virus present.
60	Murree White. .	Similar to Serial No. 69.	
61	Karachi. . .	Similar to Serial No. 29. . .	Good seed stock.
62	Garwali . .	Similar to Serial No. 1. . .	Virus infected.
63	Epicure . .	Size small to medium, shape round irregular, skin colour white, often developing light bluish purple especially in young tubers, surface smooth, eyes deep, eyebrows raised and prominent.	Poor stock, virus infected.
64	Arran Consul .	Size medium, shape round to oval round, skin colour white, surface smooth, eyes fleet, eyebrows slightly developed.	
65	Factor . . .	Similar to Serial No. 69.	
66	Great Scot . .	Similar to Serial No. 19. .	Poor stock, virus infected.
67	Talisman .	Similar to Serial No. 69.	
68	Darjeeling . .	Size small to medium, shape round, skin colour red, surface rough, occasionally smooth, eyes medium deep, eyebrows slightly developed.	
69	Up-to-date . .	Size medium to large, shape oval, occasionally flattened, skin colour white, surface smooth, eyes fleet, eyebrows slightly developed.	Good healthy stock.
70	Inverness Favourite.	Similar to Serial No. 67.	
71	Arran Banner .	Similar to Serial No. 59.	
72	Italian White Round	Similar to Serial No. 32. . .	Virus infected.
73	Pahari (grown in hills.)	Similar to Serial No. 75. . .	Do.
74	Pahari (grown in plains.)	Similar to Serial No. 75.	

APPENDIX VIII—*contd.*

Serial No.	Variety.	Tuber characters.	Remarks about disease, etc.
75	Gola Chonchiya .	Size medium, shape round tapering towards crown with recess at heel, sometimes irregular, skin colour white, surface smooth, occasionally netted, eyes deep, often crowded towards crown, eyebrows long and prominent.	Virus infected.
76	Gola Market variety.	Similar to Serial No. 75 . .	Virus infected, poor stock.
77	Do. . .	Do. . . .	Do.
78	Do. . .	Do. . . .	Do.
79	Do. . .	Do. . . .	Do.
80	Phulwa Dehra Dun (a).	Similar to Serial No. 29 . .	Poor diseased stock.
81	Phulwa Dehra Dun (b).	Similar to Serial No. 75 . .	Do.
82	Tomri seed (a) .	Similar to Serial No. 1 . .	Virus infected.
83	Tomri seed (b) .	Similar to Serial No. 69 . .	Do.
84	Patna White . .	Similar to Serial No. 29 . .	Mixture of badly diseased and healthy vigorous plant.
85	Do. . . .	Similar to Serial No. 29 . .	Do.
86	Gola . . . .	Similar to Serial No. 75 . .	Poor diseased stock.
87	Factor . . . .	Similar to Serial No. 69 . .	Virus infected.
88	Kangra Local. .	Similar to Serial No. 1 . .	Do.
89	Phulwa . . . .	Similar to Serial No. 29 . .	Good seed stock, A few plants badly diseased.
90	Gola Kalma . .	Similar to Serial No. 75 . .	Diseased stock.
91	Kalva (a) . . .	Similar to Serial No. 29 . .	Good vigorous sample.
92	Kalva (b) . . .	Similar to Serial No. 9 . . .	Do.
93	Madraji . . . .	Similar to Serial No. 29 . .	Poor diseased stock.
94	Sitbo . . . . .	Similar to Serial No. 69 . .	Virus infected.
95	Up-to-date . . .	Similar to Serial No. 69. .	
96	Great Scot . . .	Similar to Serial No. 19. .	
97	Ally . . . . .	Size medium to large, shape oval flattened, skin colour white, surface smooth, eyes fleet.	Healthy stock.

APPENDIX VIII—*contd.*

Serial No.	Variety.	Tuber characters.	Remarks about disease, etc.
98	Bengala (Hilde brands' Kidney).	Size small, shape long oval, tapering towards both ends, skin colour white, with red purplish bluish near heel, surface smooth, eyes fleet, eyebrows slightly developed.	
99	Shan . . . .	Similar to Serial No. 29 ?	
100	Darjeeling Red Round.	Similar to Serial No. 68.	
101	Darjeeling White .	Similar to Serial No. 29.	
102	Nainital (a) . .	Similar to Serial No. 1.	
103	Nainital (b) . .	Similar to Serial No. 68.	
104	Sarmauri . . .	Similar to Serial No. 1. . . .	Good seed stock.
105	Silbilati . . .	Size small, shape oval elongated, irregular, skin colour reddish purple, surface smooth, eyes very deep, eyebrows prominent.	
106	Pakri . . . .	Similar to Serial No. 68.	
107	Sindurfuti . . .	Similar to Serial No. 105.	
108	Patna . . . .	Similar to Serial No. 43.	
109	White Gola . . .	Similar to Serial No. 32. . . .	Virus infected.
110	Phulia . . . .	Similar to Serial No. 29. . . .	Do.
111	Gola . . . .	Similar to Serial No. 29.	
112	Batia (a) . . .	Similar to Serial No. 29.	
113	Batia (b) . . .	Similar to Serial No. 75 ?	
114	Simla . . . .	Similar to Serial No. 1. . . .	Good seed stock.
115	Deshi . . . .	Similar to Serial No. 29. . . .	A few diseased plants present, healthy and vigorous.
116	Italian White Round	Similar to Serial No. 32.	
117	Jullunduri Surkh (a)	Similar to Serial No. 68.	
118	Do. (b)	Similar to Serial No. 29.	
119	Dunbar Cavalier (a)	Similar to Serial No. 68.	
120	Do. (b)	Similar to Serial No. 29.	
121	Do. (c)	Similar to Serial No. 75.	
122	Do. (d)	Similar to Serial No. 1.	



APPENDIX VIII—*concl'd.*

Serial No.	Variety.	Tuber characters.	Remarks about disease, etc.
123	Dhantauri . . .	Size large, shape long oval tapering towards both heel and crown, skin colour white, surface smooth, eyes fleet occasionally picked purple, eyebrows slightly developed.	
124	Tirahi . . .	Size medium to large, shape round to oval, highly irregular, skin colour light red, surface smooth, eyes very deep, eyebrows not well marked.	
125	Rangoon . . .	Similar to Serial No. 1.	
126	Gauhati (Assam) . .	Do.	
127	Simla (Nainital) . .	Do.	
128	Italian White Round	Similar to Serial No. 32.	
129	Do. . . .	Do.	
130	Do. . . .	Do.	
131	Do. . . .	Do.	
132	Do. . . .	Do.	
133	Satha . . . .	Size small to medium, shape round to oval, skin colour white, surface smooth, eyes medium deep, eyebrows slightly developed.	
134	Italian White Round	Similar to Serial No. 32.	
135	Do. . . .	Do.	
136	Do. . . .	Do.	
137	Red long (Kidney) .	Size medium, shape round to oval round, skin colour red, surface smooth, eyes fleet, eyebrows slightly developed.	
138	Katoi (Patna Red) .	Similar to Serial No. 68. . . .	Virus infected.
139	Desi Red (a) . . .	Similar to Serial No. 29.	
140	Desi Red (b) . . .	Similar to Serial No. 9.	
141	Desi White . . . .	Similar to Serial No. 29 . . . .	Virus infected.

## APPENDIX IX-

*Estimated quantities of potatoes retained by the growers.*

(In maunds)

Names of provinces or States.	Production.	Village consumption.		Retention for seed purposes.		Total.	
		Quantity.	Per-cent- age.	Quantity.	Per-cent- age.	Quantity.	Per-cent- age.
United Provinces .	22,611,400	1,808,900	8.0	2,713,400	12.0	4,522,300	20.0
Bihar . . .	9,451,000	1,408,200	14.9	3,506,300	37.1	4,914,500	52.0
Bengal. . .	6,865,800	1,010,200	14.7	500,000	7.3	1,510,200	22.0
Assam . . .	2,097,300	688,300	32.8	415,800	19.8	1,104,100	52.6
Bombay . . .	1,631,900	57,000	3.5	233,000	14.3	290,000	17.8
Madras . . .	1,424,400	115,000	8.1	345,000	24.2	460,000	32.3
Punjab . . .	1,556,000	12,600	0.8	62,500	4.0	75,100	4.8
Mysore . . .	680,700	6,300	0.9	63,100	9.3	69,400	10.2
North-West Fron- tier Province.	371,000	49,700	13.4	68,800	18.5	118,500	31.9
Central Provinces .	325,000	7,000	2.2	1,700	0.5	8,700	2.7
Sind . . .	388,000	11,500	3.0	1,000	0.3	12,500	3.3
Patiala . . .	251,000	20,000	8.0	Negligible	..	20,000	8.0
Orissa . . .	169,000	2,900	1.7	..	..	2,900	1.7
Kashmir . . .	166,000	7,000	4.2	21,000	12.6	28,000	16.8
Gwalior . . .	56,000	8,400	15.0	Negligible	..	8,400	15.0
Baroda . . .	64,000	1,500	2.3	..	..	1,500	2.3
Hyderabad . . .	40,000	Negligible	..	..	..	..	..
Others . . .	954,200	129,900	13.6	600	0.1	130,500	13.7
Total India . . .	49,102,700	5,344,400	10.9	7,932,200	16.1	13,276,600	27.0
Burma. . . .	1,740,300	51,000	2.9	255,000	14.7	306,000	17.6

# APPENDIX X.

## PART A.

*Statement of average monthly imports of potatoes from foreign countries during 1935-36 to 1938-39.*

Months.	Kenya Colony.		United Kingdom.		Burma.		Netherlands.		Italy.		Union of South Africa.		Others.		Total.	
	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.
April . .	Mds. 359	1,420	Mds. ...	5	Mds. 1,097	2,594	Mds. ...	...	Mds. ...	...	Mds. ...	...	Mds. ...	2	Mds. 1,456	4,030
May . .	72	300	...	10	4,513	12,489	...	...	...	...	1	0	8	30	4,594	12,834
June . .	1,295	5,060	2	35	27,066	71,569	...	...	2,870	15,682	...	...	...	...	32,133	92,352
July . .	4,973	21,131	4	15	58,485	1,32,914	...	...	22,183	1,02,960	...	...	1,538	7,060	87,183	2,03,780
August . .	9,581	38,812	...	...	139,967	3,06,906	...	...	33,448	1,40,275	29	99	0,851	29,274	189,876	5,24,426
September .	11,909	50,341	99	890	105,404	3,02,567	...	...	41,976	1,67,142	...	...	3,712	15,793	223,100	5,96,733
October . .	12,961	54,410	254	1,253	205,870	4,43,176	63	251	50,353	2,51,885	1	4	1,941	8,228	271,443	7,59,213
November .	14,239	60,786	69	438	156,367	3,41,982	...	...	53,628	2,98,096	18	68	850	3,943	225,472	7,05,303
December .	6,616	26,953	10	62	79,432	1,73,404	34	201	18,098	1,03,148	...	...	344	1,297	104,534	3,05,065
January . .	839	3,562	30	140	7,016	17,378	168	863	3,095	13,631	...	...	189	643	11,337	36,217
February .	260	974	...	...	360	882	1	6	...	...	...	...	...	...	620	1,862
March . .	980	4,504	...	1	2,938	12,374	...	...	...	...	...	2	3	10	3,930	16,891
Total . .	64,093	2,68,274	468	2,849	849,475	1,878,294	206	1,321	225,951	11,01,509	49	179	15,436	66,280	1,155,738	33,18,706

## APPENDIX X—contd.

## PART B.

*Share of different provinces in the monthly imports.*

(1935-36 to 1938-39.)

Months.	Bengal.		Bombay.		Madras.		Sind.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.
April . . . . .	394	870	359	1,433	703	1,727	...	...	1,456	4,030
May . . . . .	955	1,343	38	178	3,001	11,313	...	...	4,594	12,834
June . . . . .	20,738	45,058	4,031	20,262	7,292	20,740	72	292	32,133	92,352
July . . . . .	55,349	1,23,352	20,592	98,766	3,144	9,577	8,008	32,085	87,183	2,63,780
August . . . . .	137,854	3,01,517	37,481	1,74,713	2,171	5,666	12,370	42,530	189,870	5,24,426
September . . . . .	163,713	3,58,353	34,242	1,51,401	2,038	5,531	23,167	51,448	223,160	5,96,733
October . . . . .	201,410	4,27,780	51,800	2,60,119	4,529	15,571	13,704	49,743	271,443	7,59,213
November . . . . .	152,030	3,21,527	68,158	3,59,819	4,972	22,729	300	1,228	225,472	7,05,303
December . . . . .	78,377	1,69,707	24,595	1,30,074	1,561	5,282	1	2	104,534	3,05,065
January . . . . .	5,978	13,975	1,737	8,142	1,188	4,163	2,434	9,637	11,337	36,217
February . . . . .	268	654	261	881	91	327	...	...	620	1,862
March . . . . .	2,703	11,686	993	4,514	234	691	...	...	3,930	16,891
Total . . . . .	819,775	17,75,822	244,287	12,16,302	31,524	1,09,317	60,152	2,17,265	1,155,738	33,18,706

## APPENDIX X (a).

## PART A.

Statement of monthly imports of potatoes from foreign countries.

(1935-36.)

Months.	Kenya Colony.		United Kingdom.		Burma.		Netherlands.		Italy.		Union of South Africa.		Others.		Total.	
	Quan- tity.	Value.	Quan- tity.	Value.	Quan- tity.	Value.	Quan- tity.	Value.	Quan- tity.	Value.	Quan- tity.	Value.	Quan- tity.	Value.	Quan- tity.	Value.
	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.
April . . .	...	...	1	18	1,161	2,554	...	...	...	...	...	...	...	...	1,162	2,572
May . . .	...	...	1	41	648	1,425	...	...	...	...	...	...	16	70	665	1,536
June . . .	...	...	...	...	9,342	20,552	...	...	...	...	...	...	...	...	9,342	20,552
July . . .	4,271	15,874	1	3	28,647	63,023	...	...	9,111	37,698	...	...	6,063	27,029	48,093	1,44,527
August . . .	9,810	40,128	...	...	125,604	2,76,328	...	...	36,381	1,73,318	23	95	17,045	72,425	188,803	5,62,284
September . . .	13,358	56,488	...	...	150,390	3,30,858	...	...	40,203	1,72,666	...	...	12,486	54,420	216,437	6,14,432
October . . .	10,617	53,531	...	...	206,037	4,53,281	248	1,002	30,628	1,60,033	...	...	7,273	30,750	254,803	6,98,597
November . . .	8,079	42,009	278	1,753	146,847	3,23,063	...	...	24,215	1,42,895	...	...	2,591	12,207	182,610	5,22,017
December . . .	4,841	19,382	...	...	36,504	80,308	136	800	14,774	1,02,218	...	...	...	6	56,255	2,02,714
January . . .	1,580	6,439	54	240	3,483	7,062	...	...	...	...	...	...	272	1,100	5,389	15,441
February . . .	...	...	...	...	324	712	...	...	...	...	...	...	...	...	324	712
March . . .	1,007	4,390	...	...	2,592	28,512	...	...	...	...	...	...	7	25	3,606	92,927
Total . . .	54,163	2,38,331	335	2,055	711,579	15,88,278	384	1,802	155,312	7,88,828	23	95	45,753	1,98,932	967,549	28,18,321

APPENDIX X(a)—*contd.*

## PART B.

*Share of different provinces in the monthly imports.*

(1935-36.)

Months.	Bengal.		Bombay.		Madras.		Sind.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.
April . . . . .	1,127	2,478	1	18	34	70	...	...	1,162	2,572
May . . . . .	629	1,393	17	111	19	42	...	...	665	1,536
June . . . . .	9,062	10,936	...	...	280	616	...	...	9,342	20,552
July . . . . .	27,788	61,133	10,559	11,242	859	1,890	8,987	37,202	48,093	1,44,527
August . . . . .	121,836	2,68,039	40,919	2,20,118	3,904	8,572	16,204	65,565	198,863	5,02,294
September . . . . .	115,880	3,20,934	37,150	1,67,975	5,113	11,181	28,204	1,14,312	216,437	6,14,432
October . . . . .	199,857	4,39,682	42,726	2,20,907	6,180	13,599	6,040	24,409	254,803	6,98,597
November . . . . .	145,006	3,13,802	35,000	1,98,524	1,404	9,091	...	...	182,010	5,22,017
December . . . . .	35,409	77,869	19,751	1,22,406	1,095	2,409	...	...	56,255	2,02,714
January . . . . .	3,435	7,673	1,580	6,439	102	229	272	1,100	5,380	15,441
February . . . . .	314	691	...	...	10	21	...	...	324	712
March . . . . .	2,516	27,657	1,014	4,415	76	855	...	...	3,006	32,927
Total . . . . .	693,459	15,41,307	195,317	9,85,155	19,076	40,181	59,097	2,42,078	967,549	28,18,321

## APPENDIX X (b).

## PART A.

Statement of monthly imports of potatoes from foreign countries.

(1936-37.)

Months.	Kenya Colony.		United Kingdom.		Burma.		Netherlands.		Italy.		Union of South Africa.		Others.		Total.	
	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.
April . . .	1,102	4,308	...	...	675	1,485	...	...	...	...	...	...	...	...	1,837	5,793
May . . .	4	14	...	...	6,804	14,908	...	...	...	...	4	23	15	51	6,827	15,056
June . . .	902	3,000	7	140	66,393	1,40,064	...	...	...	...	...	...	...	...	67,362	1,50,113
July . . .	3,898	18,008	15	55	111,672	2,45,674	...	...	...	...	...	...	24	85	115,009	2,63,912
August . . .	13,579	51,258	...	...	169,290	3,72,438	...	...	...	...	...	...	9,764	43,071	192,033	4,08,767
September . . .	17,139	68,061	274	2,301	178,875	3,93,525	...	...	12,880	77,713	...	...	1,901	7,859	211,135	5,49,459
October . . .	8,459	28,142	279	1,083	178,011	3,91,564	...	...	54,067	2,70,069	5	18	487	2,115	241,308	7,00,227
November . . .	3,020	15,589	...	...	174,177	3,83,189	...	...	39,201	2,01,202	...	...	808	3,504	217,812	6,03,546
December . . .	10,418	43,498	...	...	29,808	65,577	...	...	24,382	1,32,162	...	...	162	714	64,770	2,42,251
January . . .	...	...	57	231	378	831	671	3,451	2,067	10,858	...	...	480	1,402	4,273	16,833
February . . .	275	1,414	...	...	243	534	...	...	...	...	...	...	...	...	518	1,948
March . . .	1,189	5,876	...	...	864	1,900	...	...	...	...	...	...	4	10	2,057	7,786
Total . . .	60,711	2,40,167	632	4,410	917,190	20,17,749	671	3,451	133,223	6,98,904	9	41	13,705	58,967	1,126,141	30,23,689

## APPENDIX X (b)—contd.

## PART B.

Share of different provinces in the monthly imports.

(1936-37.)

Months.	Bengal.		Bombay.		Madras.		Sind.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.
April . . . . .	...	...	1,102	4,308	075	1,485	...	...	1,837	5,793
May . . . . .	2,870	3,181	15	49	3,912	11,820	...	...	6,827	15,056
June . . . . .	60,649	1,29,004	962	3,909	5,751	17,200	...	...	87,302	1,50,113
July . . . . .	109,188	2,37,222	3,913	18,153	2,484	8,452	24	85	115,609	2,03,912
August . . . . .	168,264	3,69,648	22,935	92,469	1,026	3,000	408	1,650	192,633	4,06,707
September . . . . .	178,402	3,93,866	31,842	1,53,183	891	2,410	...	...	211,135	5,49,459
October . . . . .	177,255	3,89,180	40,047	2,37,496	1,028	3,084	16,978	70,467	241,308	7,00,227
November . . . . .	170,046	3,70,706	42,488	2,15,557	4,131	12,393	1,147	4,798	217,812	6,03,544
December . . . . .	28,539	61,070	34,062	1,77,874	1,269	3,507	...	...	64,770	2,42,251
January . . . . .	408	2,041	675	2,425	503	1,509	2,687	10,858	4,273	16,833
February . . . . .	108	424	275	1,019	135	505	...	...	518	1,048
March . . . . .	...	...	1,193	5,886	864	1,900	...	...	2,057	7,786
Total . . . . .	895,729	19,56,432	186,469	9,12,128	22,699	67,271	21,244	87,858	1,126,141	30,23,689



# APPENDIX X (c).

## PART A.

*Statement of monthly imports of potatoes from foreign countries.*  
(1937-38).

Months.	Kenya Colony.		United Kingdom.		Burma.		Netherlands.		Italy.		Union of South Africa.		Others.		Total.	
	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.	Quan- tity.	Value. Rs.
April .	Mds. 273	1,407	...	...	Mds. 1,813	4,689	...	...	Mds. ...	...	Mds. ...	...	Mds. ...	...	Mds. 2,080	6,006
May .	...	...	...	...	0,044	19,801	...	...	...	...	...	...	...	...	0,044	18,801
June .	105	482	...	...	12,850	51,211	...	...	11,478	62,728	...	...	...	...	24,439	1,14,401
July .	4,903	23,256	...	...	22,003	50,713	...	...	54,370	2,77,337	...	...	60	220	81,441	3,51,532
August .	5,070	23,702	...	...	105,034	2,00,140	...	...	63,820	2,91,013	...	...	565	1,401	174,405	5,28,292
September .	5,405	23,335	...	...	147,023	3,04,062	...	...	63,781	2,32,512	...	...	401	804	210,010	5,60,803
October .	2,020	8,910	736	3,328	218,020	4,00,914	...	...	44,039	1,09,873	...	...	...	...	204,824	7,03,025
November .	8,401	38,342	...	...	224,302	4,80,081	...	...	82,415	4,64,142	...	...	...	...	315,208	9,82,505
December .	4,080	18,051	41	250	160,081	3,35,320	...	...	20,481	1,40,004	...	...	807	2,307	102,000	4,96,001
January .	291	1,310	1	8	22,052	53,272	...	...	0,020	25,078	...	...	3	12	28,367	80,580
February .	404	1,410	...	...	173	588	...	...	...	...	...	...	...	...	637	1,998
March .	...	...	...	...	...	...	...	...	...	...	...	...	1	5	1	5
Total	31,018	1,40,185	778	3,580	950,190	19,98,800	...	...	352,413	10,96,017	...	...	1,813	4,005	1,336,242	38,44,099

APPENDIX X (c)—*contd.*

## PART B.

*Shares of different provinces in the monthly imports.*

(1937-38).

Months.	Bengal.		Bombay.		Madras.		Sind.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.
April . . . . .	449	1,000	274	1,407	1,363	3,639	...	...	2,086	6,006
May . . . . .	46	113	...	...	5,998	18,688	...	...	6,044	18,801
June . . . . .	269	1,008	11,295	62,022	12,587	50,203	238	1,168	24,439	1,14,401
July . . . . .	16,274	33,543	48,247	2,60,120	6,852	17,227	11,068	50,633	81,441	3,51,532
August . . . . .	102,776	2,02,902	50,011	2,54,939	2,258	6,244	19,450	64,207	174,495	5,28,292
September . . . . .	144,064	2,95,810	30,443	1,27,320	2,059	8,252	39,144	1,29,421	216,610	5,60,803
October . . . . .	237,169	4,45,454	34,228	1,70,555	10,860	45,460	12,567	41,556	204,824	7,08,025
November . . . . .	213,247	4,24,345	90,291	5,01,074	11,670	57,146	...	...	315,208	9,82,566
December . . . . .	159,239	3,29,903	29,792	1,55,430	3,000	10,668	...	...	192,090	4,96,001
January . . . . .	17,907	38,356	3,208	17,206	4,145	14,916	3,107	10,102	28,367	80,580
February . . . . .	...	...	464	1,410	173	588	...	...	637	1,998
March . . . . .	...	...	...	2	1	3	...	...	1	5
Total . . . . .	802,390	17,72,434	298,235	16,41,404	59,975	2,83,084	85,624	2,97,087	1,336,242	38,44,099

# APPENDIX X (d).

## PART A.

### Statement of monthly imports of potatoes from foreign countries.

(1938-39).

Months.	Kenya Colony.		United Kingdom.		Burma.		Netherlands.		Italy.		Union of South Africa.		Others.		Total.	
	Quan- tity.	Value.	Quan- tity.	Value.	Quan- tity.	Value.	Quan- tity.	Value.	Quan- tity.	Value.	Quan- tity.	Value.	Quan- tity.	Value.	Quan- tity.	Value.
	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.
April	...	...	...	...	738	1,649	...	...	...	...	...	...	1	10	730	1,659
May	283	1,186	...	...	4,558	14,757	...	...	...	...	...	...	...	...	4,841	15,943
June	4,114	15,894	...	...	23,274	68,449	...	...	...	...	...	...	...	...	27,388	84,343
July	6,821	27,205	...	...	71,527	1,72,248	...	...	25,243	95,603	...	...	...	...	103,591	2,95,146
August	9,850	40,160	...	...	150,939	3,69,951	...	...	33,501	1,20,738	91	301	33	198	203,513	5,40,348
September	11,733	53,482	121	1,259	185,571	4,21,824	...	...	51,033	1,85,078	...	...	...	...	248,458	6,62,243
October	30,750	1,27,081	...	...	191,404	4,36,943	...	...	72,679	3,70,967	...	...	3	10	204,836	9,35,001
November	36,249	1,47,114	...	...	80,050	1,81,596	...	...	69,878	3,84,104	71	273	...	...	186,248	7,13,087
December	7,125	26,881	...	...	90,734	2,12,401	3	5	6,757	37,906	...	...	408	2,100	105,027	2,79,293
January	1,485	6,498	8	82	2,153	7,747	...	...	3,673	17,689	...	...	...	...	7,310	32,016
February	301	1,071	...	...	697	1,693	5	25	...	...	...	...	...	...	1,003	2,789
March	1,761	7,750	...	3	8,295	19,085	...	...	...	...	1	7	...	...	10,057	26,845
Total	110,481	4,54,412	120	1,344	818,910	19,08,343	8	30	202,954	12,21,685	103	581	445	2,318	1,193,020	35,88,713

# APPENDIX X (d)—contd.

## PART B.

Share of different provinces in the monthly imports.

(1938-39).

Months.	Bengal.		Bombay.		Madras.		Sind.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.	Mds.	Rs.
April . . . . .	...	...	...	...	739	1,650	...	...	739	1,650
May . . . . .	273	695	118	550	4,445	14,698	...	...	4,841	15,943
June . . . . .	12,972	30,286	3,869	15,116	10,547	38,941	...	...	27,388	84,343
July . . . . .	68,145	1,61,510	10,040	82,530	3,382	10,738	12,415	40,359	103,501	2,95,146
August . . . . .	158,539	3,65,430	30,059	1,31,325	1,497	4,845	13,418	38,098	203,513	5,40,348
September . . . . .	135,605	4,22,803	37,535	1,57,132	87	280	25,231	82,028	248,458	6,62,243
October . . . . .	191,361	4,36,803	84,197	4,35,517	43	140	19,235	62,541	294,836	9,35,001
November . . . . .	79,244	1,77,164	104,253	5,24,121	2,687	11,087	64	115	186,248	7,13,087
December . . . . .	90,270	2,09,956	13,882	64,787	872	4,545	3	5	105,027	2,79,293
January . . . . .	2,161	7,829	1,485	6,498	...	...	3,673	17,689	7,319	32,016
February . . . . .	653	1,500	306	1,066	44	193	...	...	1,003	2,789
March . . . . .	8,295	19,085	1,761	7,753	1	7	...	...	10,057	26,845
Total . . . . .	797,523	18,33,111	297,114	14,26,434	24,344	87,733	74,030	2,41,435	1,193,020	35,88,713

## APPENDIX XI.

*Value of imports of potatoes into India from Italy and Kenya Colony.*

Year.	Value. (In rupees).	
	Italy.	Kenya Colony.
1925-26 . . . . .	3,27,386	25,929
1926-27 . . . . .	15,82,328	60,937
1927-28 . . . . .	9,10,070	54,173
1928-29 . . . . .	11,09,891	1,80,419
1929-30 . . . . .	14,25,184	2,63,983
1930-31 . . . . .	13,15,751	63,241
1931-32 . . . . .	9,57,251	82,799
1932-33 . . . . .	12,24,113	1,14,708
1933-34 . . . . .	11,66,615	36,042
1934-35 . . . . .	11,31,399	55,836
1935-36 . . . . .	7,88,828	2,38,331
1936-37 . . . . .	6,98,904	2,40,167
1937-38 . . . . .	16,96,617	1,40,185
1938-39 . . . . .	12,21,685	4,54,412

## APPENDIX XII.

*Method of drying of potatoes for table use.*

(1) *Selection of tubers.*—Fairly large sized tubers with smooth surface and shallow eyes should be selected. In the case of small ones and those having rough surface or deep eyes the wastage is comparatively more.

(2) *Washing.*—The potatoes should be first scrubbed and thoroughly washed in water to remove all the dirt and earth adhering to the tubers.

(3) *Peeling.*—The cleaned potatoes should be peeled either by hand with the help of a knife or with a mechanical peeler. A suitable type of peeler for this purpose consists of a circular steel cylinder, the sides and bottom of which are lined with coarse carborundum crystals or wire brushes which act as abrasive surface. The potatoes are made to revolve on a rotating plate at the bottom of the drum and they come into contact against the rough surface at a high speed, thus grating the peels from them. Jets of water flow on the potatoes during this process so that the peel is washed away. On opening of the drum, clean peeled potatoes are discharged. Peeling is, however, not very perfect and considerable hand-peeling is often found necessary in this case.

Peeling is desirable though not absolutely necessary. A fairly good product can also be obtained without peeling.

(4) *Slicing.*—The potatoes for drying are usually sliced about 3/16 of an inch thick. This can be done by hand with the help of a knife or with slicing machine. Uniform slices cannot be obtained by hand cutting. Uniformity in thickness of the slices ensures uniformity in drying. With a machine, slices of uniform sizes can be cut and so whenever drying with artificial heat is done a machine should be employed for this purpose. The slices as cut should be dropped into water to prevent changes in colour by exposure to air.

(5) *Blanching.*—The sliced potatoes should be held in a basket or in a cloth sheet and they should be blanched from 2—5 minutes in boiling water at 180—212°F. On taking out the sliced potatoes from boiling water they should be rinsed in cold water before they are spread out finally for drying.

If the potatoes are to be dried in the sun they should be turned over from time to time. In the case of drying with artificial heat they should be spread in single layer and in that case the turning over of the slices is eliminated. The range of temperature in the barn with which satisfactory results were obtained in a trial with a tobacco barn is given below :—

P.M.	°F.
2.45 . . . . .	95
3.00 . . . . .	110
3.30 . . . . .	120
4.00 . . . . .	130
4.30 . . . . .	140
5.00 . . . . .	150
6.00 . . . . .	150
9.15 . . . . .	170
10.15 . . . . .	180

*Cost of drying of potatoes.*

	Rs.	A.	P.
20 maunds of potatoes at Rs. 3-12-0	75	0	0
Cartage etc. . . . .	1	8	0
Preparation, washing etc. 5 women at 0-4-0	1	4	0
Peeling charges. 80 women at 0-4-0	20	0	0
Slicing charges. 10 men at 0-6-0	6	4	0
" " 10 women at 0-4-0	3	12	0
Blanching. 10 men at 0-6-0	3	0	0
Conveyance and spreading. 8 men at 0-6-0	15	0	0
Fuel for barn. 20 maunds } at 2 maunds for a rupee	1	0	0
Fuel for blanching. 10 maunds }	0	12	0
Curd <sup>1</sup>	3	0	0
Firermen. 2 at 0-6-0 each	1	2	0
Rent of the barns Rs. 300 for a season of 3 months. Rs. 3 per day	2	0	0
Unloading charges. 3 men at 0-6-0			
Miscellaneous charges i.e., depreciation charges on appliances, equipment etc. used per day	2	0	0
Total	133	10	0

Taking the drying ratio at 5 to 1 the quantity of dried potatoes obtained will be 4 maunds. There will be some wastage which is estimated at 10 per cent and thus the actual quantity of good potatoes fit for consumption would come to 3 maunds 24 seers i.e., 295 lb. According to the details given above the cost per lb. of the dried potatoes works out to 7.2 annas.

There is scope for reducing the cost a good deal. In the above example the price of potatoes has been taken at Rs. 3-12-0 which is rather high. In the season from July to November the price is usually high on account of low supplies throughout the country, whereas in the period November to June the supplies are abundant and the average price for good quality of potatoes can safely be taken at Rs. 2-8-0 per maund. Thus there will be a saving of about Rs. 25 in the total cost on account of the cost of the fresh potatoes alone.

The peeling and slicing are at present being done by hand but if these two operations are performed with the help of a suitable machine the cost under these two items will be much less. The cost of slicing in this example has been taken at Rs. 6-4-0 whereas the cost on this account with the help of a slicing machine will not be more than Rs. 1-0-0. Similarly if peeling is also done with a machine, the cost in this case will also be considerably reduced. It might, however, be pointed out that good results have been obtained even in drying unpeeled potatoes and it might, therefore, perhaps not be essential to peel the potatoes at all. So the cost of peeling which amounts to Rs. 20 can altogether be eliminated. Thus the cost of drying can be safely reduced by Rs. 50-4-0 and accordingly the cost of dried potatoes per lb. will work out to 4.5 annas.

If sun drying is done, the cost of drying can further be reduced by another Rs. 14-4-0 and the cost per lb. of dried potatoes in this case will work out to 3.6 annas.

# APPENDIX XIII.

*Average monthly wholesale prices of potatoes in some of the important assembling and consuming markets.*  
(Per maund of 82 2/7 lb.)

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Markets	Average of	January	February	March	April	May	June	July	August	September	October	November	December	Average
		Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
<b>Assembling markets.</b>														
<i>Northern India.</i>														
Nainital	1934-37	2 14 3	2 9 0	2 15 3	2 10 6	2 9 3	2 10 6	2 12 9	2 6 9	2 8 9	3 3 3	2 15 3	3 1 3	2 12 3
Patna	1935-37	1 6 9	1 3 3	1 4 3	1 14 0	1 10 6	1 14 0	2 9 6	3 14 0	3 11 0	3 1 6	2 18 0	2 3 0	2 3 9
Darbhanga	1935-37	1 10 0	1 3 3	1 4 0	1 10 0	1 13 6	2 1 0	2 9 3	2 15 0	2 4 6	1 12 0	1 8 0	1 9 0	1 13 3
Shillong	1934-37	2 8 0	2 12 0	3 0 3	1 15 9	2 0 0	1 8 0	1 7 0	1 10 9	1 11 6	2 2 0	2 3 3	2 1 0	2 1 6
Ferozepore	1933-37	1 7 9	1 11 3	1 14 9	1 11 9	1 6 9	1 4 6	2 14 6	3 14 3	4 1 9	4 2 9	3 11 9	2 6 0	2 9 0
Jullundur	1933-37	1 6 6	1 9 9	1 12 6	1 9 6	1 6 9	1 4 6	2 6 0	3 7 6	3 11 3	3 11 3	3 5 0	1 13 6	2 4 6
Slakot	1933-37	1 10 9	1 13 3	2 0 9	1 15 6	1 6 9	1 11 3	2 6 6	3 9 0	3 13 0	3 8 3	3 3 9	2 5 0	2 7 3
Saugor	1935-37	2 1 0	1 13 9	1 15 6	1 10 3	1 10 9	2 1 0	3 6 3	5 0 0	5 4 6	5 2 9	4 0 0	3 1 9	3 1 9
Average		1 14 0	1 13 6	2 0 6	1 13 3	1 12 0	1 13 0	2 8 9	3 5 9	3 6 3	3 5 6	2 14 9	2 5 0	2 6 9
<i>Southern India.</i>														
Mettrpalaiyam	1933-36	2 3 6	2 2 9	2 8 9	3 3 0	3 2 0	3 2 9	2 15 3	2 2 3	2 3 3	2 6 6	2 11 0	2 13 0	2 10 3
Bangalore	1933-37	2 6 6	2 5 0	2 9 0	2 11 0	3 3 3	4 0 9	3 11 9	2 9 3	2 7 3	3 2 0	3 14 3	3 11 0	3 1 0
Average		2 5 0	2 3 9	2 9 0	2 15 0	3 2 0	3 9 9	3 5 6	2 6 9	2 5 3	2 12 3	3 4 0	3 4 0	2 13 6
<b>Consuming markets.</b>														
<i>Northern India</i>														
Cawnpore	1933-37	2 0 0	1 12 0	1 12 0	1 10 0	2 0 0	2 12 6	4 1 3	4 1 9	4 2 3	4 2 9	4 7 6	2 11 0	2 15 6
Agra	1935-37	3 2 0	2 4 0	2 3 6	2 6 6	2 7 3	3 3 6	3 10 6	4 14 0	4 12 6	4 13 6	5 9 3	4 13 9	3 11 0
Calcutta	1933-37	2 1 3	1 13 0	1 9 9	1 15 0	2 8 9	3 3 6	3 3 6	3 5 9	3 5 0	1 1 9	4 2 3	2 15 3	2 13 9
Chittagong	1933-37	3 1 3	2 5 6	2 0 9	2 6 6	2 12 0	2 9 6	3 11 6	3 4 6	3 10 6	5 0 9	4 3 9	3 5 3	3 1 3
Midnapore	1933-37	2 7 6	1 12 6	1 13 0	2 11 0	3 5 6	3 14 9	3 11 6	4 5 0	5 0 6	5 0 3	4 6 0	3 0 9	3 7 3
Karachi	1933-37	3 5 6	3 4 0	3 3 9	3 10 6	3 12 9	4 4 6	4 12 0	5 5 9	4 10 0	4 11 6	3 11 9	3 5 3	4 0 0
Average		2 11 0	2 3 3	2 1 9	2 7 3	2 13 0	3 5 6	3 12 3	4 3 6	4 4 3	4 7 9	4 6 9	3 5 9	3 5 6
<i>Southern India (including Bombay).</i>														
Hyderabad	1934-37	4 1 3	3 6 6	3 14 9	4 8 3	5 4 3	5 15 6	6 5 6	5 13 0	5 13 6	5 10 6	5 12 3	5 2 3	5 2 3
Bombay	1933-36	3 8 0	3 5 0	3 5 6	3 1 6	3 7 3	3 15 9	4 4 0	4 4 3	3 5 0	3 10 6	1 4 3	1 5 9	3 11 9
Madras	1933-36	3 1 6	2 13 0	3 2 0	3 9 9	3 15 6	4 0 0	3 10 9	3 4 0	3 3 0	3 7 3	3 9 9	3 10 0	3 7 3
Average		3 9 0	3 2 9	3 7 6	3 11 9	4 3 9	4 10 6	4 12 0	4 7 0	4 1 9	4 4 0	1 8 9	4 6 0	4 1 9
Rangoon	1933-37	2 11 0	2 8 0	2 5 0	2 6 6	2 5 0	2 5 6	2 5 3	2 6 9	2 4 0	2 8 3	2 14 6	2 14 0	2 7 9



## APPENDIX XIV.

*Monthly wholesale prices of potatoes in some of the important assembling and consuming markets in 1937.*  
(Per maund.)

Markets	January	February	March	April	May	June	July	August	September	October	November	December	Average
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
<b>Assembling markets.</b>													
<i>Northern India.</i>													
Nainital . . . . .	2 14 0	2 14 0	2 5 0	2 10 0	2 6 0	2 2 0	2 3 0	2 1 0	2 6 0	2 10 9	2 5 0	2 2 0	2 6 6
Patna . . . . .	1 9 6	1 0 6	1 3 0	1 11 0	1 6 0	1 4 0	2 4 0	...	...	...	...	...	1 8 6
Darbhanga . . . . .	1 10 0	1 4 0	1 6 0	1 9 0	...	...	...	...	...	...	...	...	1 7 3
Shillong . . . . .	4 0 0	3 15 0	4 4 0	2 1 0	2 5 0	1 7 0	1 10 6	1 13 6	2 0 0	2 11 0	2 10 6	2 10 0	2 10 0
Ferozepur . . . . .	1 12 3	2 3 9	2 6 9	1 6 6	1 6 3	1 4 3	2 11 9	3 6 0	3 8 0	4 4 0	2 12 9	2 5 3	2 7 3
Jullundur . . . . .	1 9 6	2 0 6	2 3 6	1 10 6	1 8 9	1 4 9	3 2 6	3 3 9	3 9 6	3 14 9	2 0 3	1 9 9	2 5 9
Slakot . . . . .	1 12 3	2 5 3	2 6 9	1 15 9	1 6 9	1 10 9	2 1 3	3 7 3	3 8 3	3 8 0	2 11 6	2 2 6	2 6 9
Saugor . . . . .	2 0 9	1 13 3	1 14 3	1 10 9	1 12 0	2 1 3	3 2 9	5 0 0	5 5 3	5 4 0	4 4 0	3 5 3	3 2 0
<i>Southern India.</i>													
Bangalore . . . . .	2 0 0	2 3 9	2 9 6	2 11 3	3 9 9	4 8 6	3 5 0	2 8 0	3 2 0	3 9 6	4 0 0	3 11 3	3 2 6
<b>Consuming markets.</b>													
<i>Northern India.</i>													
Cawnpore . . . . .	2 1 0	2 0 0	2 0 0	1 14 0	2 0 0	3 6 0	3 9 0	4 0 0	3 14 0	4 4 0	4 8 0	3 2 0	3 0 9
Agra . . . . .	2 11 6	2 11 0	2 12 9	2 15 0	3 0 6	4 1 0	4 2 0	4 13 3	4 12 0	4 13 6	6 1 6	3 13 6	3 14 0
Calcutta . . . . .	1 15 6	1 12 6	1 12 6	2 0 0	2 0 6	3 5 0	3 7 0	3 15 0	3 5 0	3 13 6	4 8 6	3 3 6	2 14 9
Chittagong . . . . .	2 14 0	1 8 0	1 8 0	2 1 0	2 4 0	2 3 10	2 5 0	2 10 0	2 12 0	3 4 0	3 6 0	2 14 0	2 7 6
Midnapore . . . . .	1 14 0	1 8 0	1 4 0	2 3 0	2 15 6	3 1 0	3 8 0	4 4 0	4 12 0	4 9 0	4 8 0	2 12 0	3 1 6
Karachi . . . . .	3 14 9	4 1 0	4 7 0	4 8 0	...	...	...	...	...	...	...	...	4 3 9
<i>Southern India.</i>													
Hyderabad . . . . .	5 0 6	2 14 6	3 4 6	4 9 3	4 10 9	4 15 9	5 11 0	3 10 3	3 14 9	4 5 0	5 12 6	5 0 6	4 7 9
Rangoon . . . . .	...	...	...	...	...	...	1 13 3	2 0 0	2 0 0	2 2 9	2 12 9	2 2 9	2 2 6

## APPENDIX XIV (a).

Monthly wholesale prices of potatoes in some of the important assembling and consuming markets of India in 1936.

(Per maund.)

Markets	January	February	March	April	May	June	July	August	September	October	November	December	Average
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
<b>Assembling markets.</b>													
<b>Northern India.</b>													
Nainital	2 5 0	2 5 0	2 10 0	1 15 0	2 1 0	2 5 0	2 8 0	1 14 0	2 11 0	3 2 0	3 13 0	3 6 0	2 9 3
Patna	1 10 6	1 4 0	1 5 6	1 7 0	1 10 6	2 8 0	2 15 0	3 14 0	3 11 0	3 1 6	2 8 0	2 3 0	2 2 5
Darbhanga	1 11 0	1 5 0	1 3 0	1 11 0	1 14 0	2 0 0	2 2 0	2 14 0	2 6 0	1 14 0	1 9 0	1 10 0	1 13 6
Shillong	1 14 9	2 3 3	1 10 3	1 11 6	1 3 6	1 1 3	1 4 3	1 10 6	1 14 3	2 13 0	1 13 6	1 10 3	1 13 3
Terozpur	1 2 9	1 6 9	1 10 3	1 11 6	1 3 6	1 1 3	3 0 9	3 12 9	4 11 3	3 11 9	3 7 9	1 13 9	2 6 6
Jalundar	1 3 0	1 5 3	1 7 9	1 17 6	1 3 6	1 12 3	2 6 0	3 0 6	3 7 6	3 4 3	3 8 0	1 7 0	2 1 3
Slalkot	1 7 9	1 7 9	1 10 3	1 12 3	1 4 6	1 12 3	2 6 0	3 0 6	3 11 6	3 7 3	3 3 9	2 5 3	2 2 5
Saugor	2 0 0	1 12 0	2 0 0	1 8 0	1 8 0	2 0 0	4 0 0	0 0 0	5 0 0	5 4 0	3 4 0	2 8 0	3 1 0
<b>Southern India.</b>													
Mettupalayam	2 0 9	1 14 9	2 2 9	3 3 9	3 3 0	3 0 6	2 11 9	2 2 0	2 0 0	2 0 9	2 8 9	3 0 6	2 8 0
Bangalore	2 3 0	2 2 6	2 2 9	2 5 9	2 8 9	3 7 0	3 6 3	2 4 6	2 0 3	2 5 0	3 7 6	3 5 9	2 10 3
<b>Consuming markets.</b>													
<b>Northern India.</b>													
Cawnpore	1 10 0	1 6 0	1 6 0	1 6 0	2 4 0	2 9 0	4 1 0	4 7 0	4 4 0	4 8 0	4 7 0	2 10 0	2 14 6
Agra	2 14 6	1 12 6	1 12 0	1 15 0	2 0 3	2 15 3	3 11 0	5 0 6	4 12 0	4 10 6	5 2 6	3 2 0	3 5 0
Calcutta	1 13 6	1 12 0	1 10 6	2 0 6	2 8 0	3 11 0	3 4 0	3 6 6	3 6 0	3 14 6	4 4 0	3 2 0	2 15 0
Chittagong	2 8 0	1 12 0	1 8 0	2 0 0	3 0 0	3 8 0	3 8 0	3 8 0	3 8 0	4 8 0	4 8 0	3 0 0	2 15 0
Madras	2 13 0	2 0 0	2 0 0	2 0 9	3 3 0	3 1 0	2 13 0	3 8 0	5 0 0	5 0 0	4 8 0	3 15 0	3 5 0
Karachi	3 8 0	3 2 0	2 11 3	3 0 3	3 0 0	3 9 3	4 12 0	5 8 0	3 10 0	4 2 0	4 5 0	3 15 0	3 12 9
<b>Southern India (including Bombay).</b>													
Hyderabad	4 5 0	4 5 0	4 10 0	4 7 9	4 5 0	5 11 9	4 15 6	4 15 9	5 11 9	5 12 9	6 1 3	4 5 0	4 15 6
Bombay	3 5 6	4 0 9	4 6 6	2 15 0	3 5 0	3 13 9	4 0 9	4 0 9	3 10 9	4 0 9	3 10 9	4 9 6	3 13 3
Madras	3 0 9	2 15 0	3 2 3	3 6 6	3 3 3	3 9 0	3 4 0	2 13 6	2 12 9	...	3 8 9	3 3 9	3 3 0
Rangoon	2 4 0	2 6 0	2 2 0	2 4 0	2 1 0	2 6 0	2 9 0	2 6 0	2 2 0	1 15 0	2 2 0	2 11 0	2 4 3

## APPENDIX XIV (b).

Monthly wholesale prices of potatoes in some of the important assembling and consuming markets in 1935.

(Per maund.)

Markets	January	February	March	April	May	June	July	August	September	October	November	December	Average
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
<b>Assembling markets.</b>													
<i>Northern India.</i>													
Nainital	3 8 0	2 8 0	3 15 0	3 4 0	2 11 0	3 1 0	3 4 0	3 2 0	2 14 0	3 15 0	2 8 0	3 8 0	3 2 9
Patna	1 0 6	0 15 0	1 4 0	1 1 6	1 15 0	2 2 0	2 12 0	3 0 0	2 12 0	1 10 0	1 7 0	1 8 0	1 4 0
Darbhanga	1 9 0	1 1 0	1 3 0	1 10 0	1 13 0	2 2 0	2 12 0	3 0 0	2 12 0	2 7 3	2 12 3	2 3 6	1 13 0
Shillong	2 13 0	3 8 0	3 6 0	1 3 0	1 3 0	1 2 6	1 9 0	1 11 6	1 12 3	3 13 0	3 14 0	2 3 0	2 2 3
Ferozepur	1 6 0	1 6 0	1 10 0	2 2 3	1 12 0	1 5 3	2 6 0	4 10 6	3 15 6	3 13 0	3 6 0	2 8 0	2 9 0
Jullundur	1 5 0	1 6 0	1 7 0	1 9 0	1 5 3	1 5 3	1 12 3	3 11 6	4 2 0	3 12 0	3 6 0	2 4 9	2 4 3
Sialkot	1 8 0	1 9 0	1 0 0	1 14 6	1 9 0	2 11 3	2 3 3	3 11 6	4 2 0	4 1 0	3 13 0	2 2 0	2 8 0
Saugor	2 2 0	2 0 0	2 0 0	1 12 0	1 12 0	2 4 0	3 0 0	4 0 0	3 8 0	5 0 0	4 8 0	3 8 0	3 1 0
<i>Southern India.</i>													
Mettupalayam	2 0 0	1 12 0	2 1 3	3 3 0	3 0 6	2 12 0	2 9 0	2 1 0	2 0 3	2 6 0	2 5 6	2 6 9	2 7 0
Bangalore	2 3 0	2 5 0	2 8 3	3 1 0	3 7 0	3 12 0	3 9 6	2 13 0	2 7 9	3 3 6	3 12 3	3 4 0	3 0 9
<b>Consuming markets.</b>													
<i>Northern India.</i>													
Cawnpore	1 11 0	1 13 0	1 13 0	1 13 0	1 13 0	2 12 0	1 4 0	1 2 6	1 6 0	3 15 0	4 10 0	2 3 0	2 15 0
Agra	3 12 0	2 7 0	2 1 6	2 5 0	2 3 3	2 10 3	3 2 0	1 12 6	1 4 0	5 0 6	5 8 6	7 12 6	3 14 3
Calcutta	2 0 6	1 11 0	1 10 6	1 12 6	2 13 0	4 0 0	3 7 0	3 9 0	3 6 0	3 15 6	4 8 6	3 11 0	3 0 9
Chittagong	2 8 0	2 4 0	2 0 0	2 8 0	2 8 0	2 8 0	3 8 0	3 8 0	3 8 0	3 8 0	4 0 0	3 0 0	3 15 6
Midnapore	1 11 0	1 12 0	1 15 0	2 1 0	2 8 0	4 2 6	3 6 0	1 0 0	1 0 0	5 0 0	3 4 0	2 3 0	3 0 3
Karachi	2 15 3	3 2 3	3 6 3	3 10 9	3 9 9	3 9 0	4 10 0	5 10 0	1 8 9	5 3 0	4 0 0	3 12 0	4 0 0
<i>Southern India (including Bombay)</i>													
Hyderabad	3 7 9	3 9 3	4 5 3	1 1 3	7 1 0	7 1 0	6 14 9	0 6 0	5 9 9	7 1 9	5 12 6	5 13 0	3 9 9
Bombay	4 12 6	3 10 9	3 10 9	3 10 9	4 0 9	3 10 9	3 7 9	2 15 0	3 10 9	2 12 0	4 0 9	3 13 9	3 9 0
Madras	3 0 6	2 9 6	3 2 0	3 11 9	4 0 0	4 2 3	3 3 0	3 8 0	3 3 3	3 7 6	...	...	3 7 0
Rangoon	3 2 0	2 10 0	2 8 0	2 9 0	2 0 0	2 5 0	2 5 0	2 10 0	2 6 0	2 12 0	3 0 0	3 4 0	2 10 9

## APPENDIX XIV (c).

Monthly wholesale prices of potatoes in some of the important assembling and consuming markets in 1934.

(Per maund).

Markets	January	February	March	April	May	June	July	August	September	October	November	December	Average
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
<b>Assembling markets.</b>													
<i>Northern India.</i>													
Nainital . . .	...	...	...	2 13 0	3 3 0	3 2 0	3 4 0	2 10 0	2 4 0	3 2 0	3 3 0	3 5 0	2 15 9
Shillong . . .	1 4 3	1 9 3	1 5 9	2 10 3	2 7 3	2 0 6	1 13 3	1 7 3	1 4 0	1 4 6	1 8 6	1 12 9	1 11 3
Ferozepur . . .	1 11 6	1 14 0	2 3 3	1 14 3	1 7 9	1 6 3	3 5 0	4 0 0	4 10 0	4 14 0	4 4 0	2 4 3	2 13 3
Jullundur . . .	1 10 0	1 13 9	2 3 0	1 12 3	1 6 9	1 5 9	1 9 0	3 9 9	3 12 9	3 12 0	3 10 6	1 13 9	2 6 0
Shalkot . . .	2 2 6	2 3 6	2 11 9	2 5 6	1 7 9	1 10 0	2 7 3	3 1 3	3 8 0	3 1 3	3 0 9	2 6 6	2 8 3
<i>Southern India.</i>													
Mettpalaliyam . . .	2 6 9	2 6 9	2 8 3	2 12 9	3 5 0	3 11 9	3 13 3	2 2 6	2 0 9	2 2 6	3 0 3	3 1 0	2 12 6
Bangalore . . .	2 10 6	2 5 0	2 10 0	2 15 6	3 15 0	5 0 0	4 10 9	2 10 9	2 9 6	2 13 0	3 9 9	3 4 6	3 4 3
<b>Consuming markets.</b>													
<i>Northern India.</i>													
Cawnpore . . .	2 10 0	1 13 0	1 13 0	1 7 0	1 15 0	2 8 0	4 7 0	4 0 0	4 0 0	4 0 0	4 2 0	2 0 0	2 14 8
Calcutta . . .	2 9 0	2 3 6	1 15 6	1 13 0	2 7 6	2 13 6	3 2 6	3 0 6	3 4 6	4 0 0	4 9 0	2 12 0	2 14 3
Chitragong . . .	3 8 0	2 8 0	2 0 0	2 8 0	3 0 0	3 0 0	3 4 0	3 4 0	4 0 0	4 0 0	4 0 0	3 12 0	3 3 9
Midnapore . . .	2 14 0	1 12 0	1 14 0	3 9 0	3 14 0	4 10 0	4 5 6	4 12 0	5 8 0	5 1 0	4 12 0	3 1 0	3 13 3
Karnachi . . .	3 8 3	3 7 3	3 1 3	4 1 0	4 11 0	6 6 6	4 10 0	5 8 0	5 5 3	5 1 0	3 8 9	2 9 0	4 5 0
<i>Southern India (including Bombay).</i>													
Hyderabad . . .	3 7 9	2 13 6	3 7 9	4 11 9	4 15 6	6 1 3	7 13 0	8 3 9	8 3 9	5 7 0	5 6 9	5 7 0	5 8 3
Bombay . . .	3 4 9	3 4 3	2 15 0	3 3 6	3 8 9	4 9 6	4 13 3	5 5 3	2 14 6	4 1 9	4 12 3	3 7 9	3 13 9
Madras . . .	3 3 0	2 14 3	3 1 6	3 10 9	4 4 6	4 7 6	4 8 0	3 2 6	2 15 6	3 2 0	3 12 3	3 14 6	3 9 3
Rangoon . . .	...	...	...	...	...	...	3 3 3	3 3 3	3 0 6	3 12 3	4 2 9	3 5 0	3 7 3

## APPENDIX XIV (d).

Monthly wholesale prices of potatoes in some of the important assembling and consuming markets in 1933.

(Per maund.)

Markets	January	February	March	April	May	June	July	August	September	October	November	December	Average
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
<b>Assembling markets.</b>													
<b>Northern India.</b>													
Ferozepur . .	1 6 0	1 9 6	1 10 9	1 8 9	1 4 0	1 3 0	3 0 0	3 11 6	3 12 6	4 3 0	4 4 0	2 15 0	2 8 9
Jullundur . .	1 4 9	1 6 0	1 8 6	1 8 0	1 5 9	1 5 0	2 8 0	3 6 0	4 0 0	3 13 0	3 8 0	2 0 0	2 4 9
Sialkot . .	1 6 6	1 7 9	1 13 3	1 13 6	1 4 6	1 12 6	2 15 3	3 14 0	4 3 0	3 15 6	3 5 9	2 8 0	2 8 6
<b>Southern India.</b>													
Mettupalayam .	2 7 6	2 7 3	3 0 6	3 4 6	2 15 3	3 1 9	2 10 0	2 1 0	2 5 9	3 1 3	2 13 6	2 12 3	2 12 0
Bangalore . .	2 15 9	2 8 6	2 14 0	2 5 0	2 7 6	3 8 0	3 11 6	2 9 3	2 1 0	3 10 6	4 9 3	4 13 0	3 2 0
<b>Consuming markets.</b>													
<b>Northern India</b>													
Cawnpore . .	...	...	...	1 10 0	2 0 0	2 12 0	4 1 0	4 0 0	4 3 0	4 3 0	4 11 0	3 8 0	3 7 0
Calcutta . .	2 0 0	1 10 0	1 0 0	1 15 6	2 6 6	2 4 6	2 13 0	2 14 0	3 2 0	4 13 9	2 13 0	2 0 0	2 7 9
Chittagong . .	4 0 0	3 12 0	3 4 0	3 0 0	3 8 0	2 12 0	3 8 0	3 8 0	4 8 0	5 0 0	5 0 0	4 0 0	3 13 0
Midnapore . .	3 2 0	1 14 0	2 0 0	3 10 0	4 3 0	4 11 0	4 7 0	5 1 0	5 11 0	5 7 0	4 14 0	3 5 0	4 0 6
Karachi . .	2 14 0	2 7 6	2 9 6	3 0 3	3 8 0	3 9 0	5 0 0	4 13 0	5 0 0	4 8 0	3 1 3	3 0 9	3 10 0
<b>Southern India (including Bombay)</b>													
Bombay . .	2 9 3	2 4 9	2 5 9	2 8 6	2 15 0	3 13 3	4 10 0	4 12 6	3 0 6	3 9 6	4 9 9	5 8 3	3 9 0
Madras . .	...	...	...	...	...	3 13 0	3 11 9	3 7 6	3 13 0	3 12 6	3 8 0	3 12 0	3 11 0
Rangoon . .	...	...	...	...	...	...	1 11 6	1 15 3	1 11 6	1 15 3	2 7 3	3 0 6	2 2 3

## APPENDIX XV.

*Annual average wholesale prices of potatoes in some of the important markets of India.*

(1933 to 1937).

Name of the market.	1933	1934	1935	1936	1937
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Nainital . . . . .	..	2 15 9	3 2 9	2 9 3	2 6 6
Cawnpore . . . . .	3 7 0	2 14 3	2 15 0	2 14 6	3 0 9
Patna . . . . .	..	..	1 4 0	2 5 6	1 8 6
Calcutta . . . . .	2 7 9	2 14 3	3 0 9	2 15 0	2 14 9
Shillong . . . . .	..	1 11 3	2 2 3	1 13 3	2 10 0
Bombay . . . . .	3 9 0	3 13 9	3 9 0	3 13 3	..
Madras . . . . .	3 11 0	3 10 0	3 6 9	3 2 9	..
Mettupalaiyam . . . . .	2 12 0	2 12 6	2 7 0	2 8 0	2 11 3
Jullundur . . . . .	2 4 9	2 6 0	2 4 3	2 1 3	2 5 9
Sialkot . . . . .	2 8 6	2 8 3	2 8 6	2 5 3	2 6 9
Karachi . . . . .	3 10 0	4 5 0	4 0 0	3 12 9	4 3 9
Hyderabad . . . . .	..	5 8 3	5 9 9	4 15 6	4 7 9

## APPENDIX

*Weekly retail prices (per seer) of  
Market from*

Months and quality		1932-33.				1933-34.			
		1st week	2nd week	3rd week	4th week	1st week	2nd week	3rd week	4th week
		A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.
April	{ 1st quality	1 3	1 3	1 3	1 0	1 6	1 6	2 0	2 0
	{ 2nd "	1 0	1 0	1 0	0 9	1 3	1 3	1 3	1 6
May	{ 1st "	1 3	1 3	1 3	0 3	2 0	1 3	2 0	2 0
	{ 2nd "	0 9	0 9	0 9	0 9	1 6	1 0	1 0	1 0
June	{ 1st "	1 3	1 3	...	1 3	1 0	1 0	1 0	1 3
	{ 2nd "	1 0	1 0	1 0	1 0	0 9	0 9	0 9	1 0
July	{ 1st "	2 0	2 0	2 0	2 0	1 3	1 3	1 6	2 0
	{ 2nd "	1 3	1 3	1 3	1 3	1 0	1 0	1 3	...
August	{ 1st "	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 9
	{ 2nd "	...	...	...	...	...	...	...	...
September	{ 1st "	2 9	2 0	2 0	2 0	2 0	2 0	2 0	2 0
	{ 2nd "	...	...	...	...	...	...	...	...
October	{ 1st "	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0
	{ 2nd "	...	...	...	...	...	...	...	...
November	{ 1st "	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0
	{ 2nd "	1 6	1 6	1 6	...	...	1 9	1 9	1 9
December	{ 1st "	2 0	2 0	2 0	2 0	1 9	2 0	2 0	2 0
	{ 2nd "	1 6	1 6	1 6	1 6	1 6	1 6	1 6	1 6
January	{ 1st "	1 6	1 6	1 9	1 3	1 6	...	1 3	1 3
	{ 2nd "	1 3	...	1 6	1 0	1 3	1 0	...	1 0
February	{ 1st "	1 9	1 6	1 9	1 6	1 6	1 6	1 6	1 6
	{ 2nd "	1 3	1 3	1 3	1 0	1 0	1 0	...	1 0
March	{ 1st "	1 6	1 6	1 6	...	1 6	...	1 6	1 6
	{ 2nd "	1 3	...	1 3	1 3	1 3	1 3	1 3	1 3

## XVI.

*potatoes prevailing at Lahore Municipal**1932-33 to 1936-37.*

1934-35.				1935-36.				1936-37.			
1st week	2nd week	3rd week	4th week	1st week	2nd week	3rd week	4th week	1st week	2nd week	3rd week	4th week
A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.
2 0	2 0	2 0	2 0	1 3	1 3	1 3	1 3	1 3	1 3	1 3	1 3
1 3	1 3	1 3	1 3	1 0	1 0	1 0	1 0	1 0	1 0	1 0	1 0
2 0	1 6	1 3	1 3	1 3	1 3	1 3	1 3	1 3	1 3	1 3	1 3
1 3	1 0	1 0	1 0	1 0	1 0	1 0	1 0	1 0	1 0	1 0	1 0
1 3	1 3	1 3	1 3	1 3	...	1 3	1 3	1 0	1 0	1 0	1 6
1 0	1 0	1 0	1 0	0 9	0 9	0 6	0 9	0 9	0 9	0 9	1 3
1 6	1 6	1 6	1 6	1 3	1 6	2 6	2 0	1 6	2 0	2 0	2 0
1 3	1 3	1 3	1 3	1 0	1 3	...	1 6	1 3	1 6	1 6	1 6
2 6	2 6	...	2 6	2 6	2 6	2 6	2 6	2 3	2 9	2 6	2 3
2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0	1 6	2 0	2 0	2 0
2 0	2 0	2 0	2 0	2 6	2 6	2 6	...	2 0	2 3	2 3	2 3
...	...	...	...	2 0	2 0	2 0	2 0	1 6	1 6	1 6	1 6
2 3	2 0	2 0	2 0	2 6	2 3	2 6	...	2 0	2 3	2 3	2 3
...	...	...	...	...	...	...	...	1 6	1 6	1 6	1 6
2 0	2 0	2 3	2 3	2 0	2 0	2 0	1 0	1 9	1 9	1 9	1 9
1 6	1 6	...	1 9	1 9	...	1 9	1 6	1 6	1 6	1 6	1 6
2 0	2 0	...	2 0	2 6	1 6	2 0	2 0	1 6	1 6	1 6	1 3
1 3	1 6	1 6	1 6	2 0	1 3	1 6	1 0	1 0	1 0	1 0	1 0
1 3	1 3	1 3	1 3	1 0	1 0	1 0	1 0	1 6	1 3	1 6	1 6
1 0	0 9	0 9	0 9	0 9	0 9	0 9	0 9	1 0	1 0	1 0	1 0
1 6	1 6	1 0	...	1 0	1 0	1 0	1 0	1 6	1 3	1 6	...
1 0	1 0	...	...	0 9	0 9	0 9	0 9	1 0	1 0	1 0	1 0
1 6	1 6	1 0	1 0	1 0	1 0	1 0	1 0	1 6	1 6	1 6	1 6
1 0	1 0	...	...	...	0 9	0 9	0 9	1 3	1 3	1 3	1 3



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OF  
REWARDS

## APPENDIX XVII.

*Copy of a market report issued by a Simla firm.*

### POTATOES EXPRESS ADVICE.

*Simla, 21st November 1936.*

Seed time in C. P. and Gujarat has come. As Bengal seed is nearly ended, present rates are very favourable. Import is only 1,000 bags daily.

Today Phool 2-5-0. *Chhatta* seed 2-9-0. Special big 2-9-0.

Rashan in small quantity can be had at about  
1-8-0 a maund.

If suitable please order telegraphically.

PROMPT  
SERVICES  
AND  
BEST

CAREFUL-MOST  
ATTENTION

This Express Report is sent as a telegram to reduce telegraphic expenses.

## APPENDIX XVIII.

*Another type of market report issued by the same (Simla) firm.*

New customers should send Rs. 2 per bag advance with order.

*Simla, dated the 20th October 1936.*

To-day's rates for potatoes in the Simla market are :—

Phool (big)	Gadd (mixed)	Rashan
Rs. A. P.	Rs. A. P.	Rs. A. P.
2 11 3	2 8 0	2 3 9

Special *Chhatta* seed is to-day at Rs. 2-12-3.

Import is about 2,500 bags daily. Quality is now entirely ripe and dry. Despatches to all parts of India even to the farthest ends are now regularly going on without any extraordinary risk of damage in transit. Market is not expected to go down.

We will to-day give rather lengthy details and most up-to-date informations regarding Simla Hills potatoes for the guidance of all our customers.

It is an admitted fact that potatoes grow in this time of the year in cold climate. The more the cold, the better the potatoes crop grows. Accordingly, the hill stations which are situated at height of 5,000 feet or over and where snow falls in abundance, very delicious, good looking and durable potatoes are produced. Simla proper is a hill station 7,200 feet high and the villages beyond Simla are even higher. The height of other hill stations which produce potatoes in the same season as Simla together with the details of snowfalls are as under :—

Simla	.	.	.	7,200 feet	.	.	.	Snow falls abundantly.
Solan	.	.	.	4,900 feet	.	.	.	Snow very seldom and small.
Kalka	.	.	.	2,143 feet	.	.	.	No snow falls at all.

That is why not a single potato could ever grow in Kalka. Potatoes sold at Kalka are actually the product of Simla market and you can buy from us our Simla potatoes in the same way as Kalka merchants buy from here.

Jogindranagar	.	.	.	3,903 feet	.	.	.	Snow very seldom and small.
Dehra Dun	.	.	.	4,500 feet	.	.	.	Small snow falls.
Poona	.	.	.	1,100 feet	.	.	.	No snow falls.
Haldwani	.	.	.	4,300 feet	.	.	.	Small snow falls.
Gauhati	.	.	.	2,500 feet	.	.	.	Seldom snow falls.

It will be seen from above that no other hill station is higher than Simla. As a result Simla and the territory beyond Simla alone produce the most delicious, good looking and very durable potatoes throughout India and these potatoes are best suitable for seeds. Simla is the biggest potatoes market in India.

In Simla and hills beyond Simla, the potatoes are sown in February and the crop become ready in August. All the big snowfalls of February serve a manure for the potatoes crop and make the potatoes delicious and durable and best adapted for seed purposes.

When the crop becomes ready, the potatoes of Simla proper and from all the local area come into Simla market on mules. There being no other outlet the entire product comes to Simla.

APPENDIX XVIII—*contd.*

In Simla market the potatoes rate is fixed by an open bid every day in the morning. The highest bid is regarded as rate for the entire import in the market on that day and no commission agent (*arti*) can charge a single pie more or less than the uniform rate fixed by the bid. This system of fixing rate is the best and presumably not used in other markets. Orders received by post and telegrams are in the same way treated as if the *beopary* is present and there can be no complaint on this point.

Proprietors personally attend the bid every morning and as soon as the rate is fixed we intimate the same to all our *beoparies* by telegrams, letters and market reports as is considered necessary. All orders which we get from our numerous *beoparies* all over India are then attended by one of the proprietors. Another proprietor personally supervises the quality and weight of potatoes of each order. All the bags are carefully seen and sent to the railway station for booking. Still another of our proprietors himself attends the railway booking office and sees that all orders are booked, loaded, and despatched from Simla the same day, as far as practicable. All this is done for the benefit of the *beoparies*.

That is not all. We have appointed a special representative at Kalka and have installed a special telephone there. As soon as the wagons leave Simla (during these days many trains only with our load are going) we give particulars to our representative at Kalka over the telephone. He, then supervises the transshipments in broad-gauge trains and ensures that our wagons leave Kalka as well at the first available opportunities. Wagon numbers are accordingly communicated by us to the *beoparies*. In particular cases we also arrange to send railway telegrams for junctions concerned to avoid delay in transit.

All the correspondence including telegrams and hand notes are attended to by the proprietors and every endeavour is made to comply with the wishes of our kind customers as far as possible.

By placing orders in Simla with our firm the customers therefore get the following additional advantages which are not obtainable in other hill stations or with other firms in Simla :—

- (1) From Simla you get potatoes grown in the highest valley.
- (2) You get potatoes grown in snow and, therefore, most durable, delicious and best for seeds.
- (3) All your orders are attended to under the direct supervision of the proprietors.
- (4) As we work only as commission agents and are not exporting potatoes on our own account we attend to *beoparies* work as our own and safeguard their interests in every way.
- (5) You get full advantage of our fifty years' experience in the potatoes line.
- (6) Our firm is always ready to consider suggestions from the *beoparies* to improve our services further on.
- (7) The smallest and the largest orders are treated alike.
- (8) All enquiries, orders, etc., are personally attended to. We are always at your service and await your orders when it may be suitable to you.

---

NOTE.—Weight of potatoes in Simla is 42 British (railway) seers per maund, *i.e.*, each bag weighs 2 maunds, but in railway receipt is charged for 1 md: 35 srs. in invoice 81 bags make a full wagon load on which special reduced rate of railway freight is charged. Inquiries solicited.

*Grade designations and definition of quality of seed potatoes produced in India.*

Definition of quality.		Tolerance.			
Grado designation.	Size Minimum diameter.	General characteristics.	Conformity to variety.	Undersize or oversize.	*Disease, damage, etc.
1	2	3	4	5	6
AGMARK Largo	1 1/2"	The tubers shall be reasonably clean and healthy. The tubers shall be viable and reasonably firm. The tubers shall have the characteristic shape, and colour of the variety. Each tuber shall have at least two sound well developed eyes.	Tubers of variety other than specified on the label or mixture of these are permitted to the extent of 5 per cent by count as determined on the basis of a representative sample.	A tolerance of 10 per cent shall be allowed for accidental errors in grading in respect of tubers corresponding with the size specifications in the next lower and/or higher grade.	(1) Tubers having mechanical injury and showing signs of external damage shall not exceed 5 per cent by count in any representative sample. (2) Superficial blemishes not affecting keeping quality shall not exceed in aggregate an area equal to 1/4th of the total surface area on any tuber.
AGMARK Medium	1 1/4"				
AGMARK Small	1 1/8"				
					7
					The presence of earth and other foreign matters shall not exceed 2 per cent by weight.

\*Any disease or defect, the presence of which may be established by cutting open the tuber, shall be taken into account, and potatoes having worm or slug holes penetrating into the flesh shall be regarded as damaged.

†Tubers which exceed 1½ inch in diameter in the case of seed potatoes raised in the plains and two inches in the case of those raised in the hills shall not be permitted, to the grade

In the latter case when the tubers have been passed over a riddle of greater mesh than one inch the minimum size may at the packer's discretion be appended to the grade name, *e.g.*, AGMARK Largo (size 1½ inch).

## APPENDIX XX.

*Tentative grade designations and definition of quality of potatoes produced in India.*

Grade designation.	Definition of quality.		Applicable to quantities.			
	General.	Appl. cable to single tubers size (minimum diameter in.).	Tolerances.			
			Conformity to variety, etc.	Undersize or oversize.	Disease*, damages, etc.	Earth and/or extraneous matter.
1	2	3	4	5	6	7
AGMARK Special	Reasonably clean, healthy potatoes, free from serious defect and suitable for human consumption.	1½† (Inches.)	At least 95 per cent by weight must conform to the variety as and when specified.	Not more than 3 per cent of the total weight may pass through sieve having circular holes with a diameter of the minimum size specified (in column 3) for the grade, included in this, not more than 0.5 per cent of the total weight may pass through a 1 in. mesh; potatoes which exceed 3½ inches in their smallest diameter shall be excluded.	Not more than 3 per cent of the total weight may consist of appreciably diseased, damaged or unsightly potatoes, and included in this amount.	Not more than 4 per cent may be present, the percentage to be calculated on the net weight of screened potatoes.
AGMARK Grade I.	Ditto.	1½†	Ditto.		Ditto.	Ditto.
						6 per cent of the total weight.

\*1. Any disease or defect, the presence of which may be established by cutting open the potato shall be taken into account, and potatoes having worm and slug holes penetrating into the flesh shall be regarded as damaged.

2. Potatoes affected by superficial disease or damage shall not be regarded as diseased or damaged unless more than 1/10 of the surface is so affected.

3. A potato shall only be regarded as being obviously affected with the soft rot, if, at the time of inspection, it is squashy and/or the surface is at some part distinctly broken or wet owing to disease.

† When the potatoes have been passed over a riddle of greater mesh than 1½ in., the minimum size may, at the seller's discretion be appended to the grade name, e.g., "Agmark Special" (2 in.).

## APPENDIX XXI.

*Conditions for the grant of Certificate of Authorisation under the Agricultural Produce (Grading and Marking) Act, 1937.*

- (a) That grade designation marks shall only be applied to the articles mentioned in the Certificate of Authorisation and at the premises therein mentioned ;
- (b) that during the operation of the certificate the holder thereof shall, at all reasonable times, give access to the premises named therein to any person duly authorised by the Agricultural Marketing Adviser or by the Central Government and shall afford him facilities for ascertaining that marking is being correctly performed ;
- (c) that the holder of the certificate will keep a record of the number of packages marked with each grade designation mark and will permit any person duly authorised by the Agricultural Marketing Adviser or by the Central Government to examine the record ;
- (d) that the holder of the certificate will permit any duly authorised person to take samples of any graded produce or to open and inspect any package bearing a grade designation mark, provided that all samples shall be paid for ;
- (e) that any person authorised in this behalf by the Agricultural Marketing Adviser or by the Central Government may cancel or remove a grade designation mark from any produce which is the property of the holder of the certificate in the possession of the holder of the certificate or of his agent, should such produce be found by such person not to comply with the definition of quality prescribed for that article ;
- (f) that all rules made under the Agricultural Produce (Grading and Marking) Act shall be observed ;
- (g) that any Certificate of Authorisation may be cancelled, revoked, modified or suspended by the Agricultural Marketing Adviser or by any other person authorised by the Central Government in that behalf provided that 14 days' notice in writing shall be given to the certificate holder at the address stated on the certificate and an opportunity given him for showing cause why his certificate should not be cancelled, revoked, modified or suspended ;
- (h) that any holder of a Certificate of Authorisation may, with the written consent of the Agricultural Marketing Adviser, use a replica of the AGMARK design on his business papers and catalogues ; and
- (i) that any stencil, rubber stamp, punch or other instrument or label required for marking produce in the prescribed manner shall only be obtained from the Agricultural Marketing Adviser or a person authorised by him on payment of such charges as the Central Government may from time to time fix in this behalf, shall be kept in safe custody by the holder of the certificate and shall, so far as may be, be returned to the Agricultural Marketing Adviser or such authorised person when the certificate ceases to be valid.

Definition of quality.						
Grade designation.	General.	Applicable to single tubers.	Applicable to quantities.			
			Tolerances.			
		Size. (Minimum diameter.)	Conformity to variety, etc.	Undersize or oversize.	* Disease, damage, etc.	Earth and/or extraneous matter.
1	2	3	4	5	6	7
E. & W. No. 1 Size.	Reasonably clean, healthy potatoes, free from serious defect and suitable for human consumption.	1½†	At least 95 per cent by count must conform to the variety as and when specified and to the type of soil on which grown, where such is declared.	Not more than 3 per cent of the total weight may pass through a riddle or sieve having a square mesh of the minimum size† specified (in col. 3) for the grade, and, included in this, not more than 0.5 per cent of the total weight may pass through a 1 inch mesh: potatoes which exceed 3½ in. in their smallest diameter shall be excluded. Otherwise in regard to size, the potatoes shall be as grown.	Not more than 3 per cent of the total weight may consist of appreciably diseased, damaged or unsightly potatoes, and including in this amount, not more than 0.25 per cent of the total weight may be obviously affected with soft rot.	Not more than 4 per cent may be present in potatoes loaded up to November 1st in the year of harvesting, and 2 per cent after that date; the percentage to be calculated on the net weight of screened potatoes.
E. & W. No. 2 Size.		1 5/8				
E. & W. No. 3 Size.		1½				
						Maximum aggregate of all defects under cols. 5, 6 and 7.
						8
						5 per cent of the total weight.

\* (i) Any disease or defect, the presence of which may be established by cutting open the potato, shall be taken into account, and potato having worm or slug holes penetrating into the flesh shall be regarded as damaged.

(ii) Potatoes affected by superficial disease or damage shall not be regarded as diseased or damaged unless more than one-tenth of the surface is so affected.

(iii) A potato shall only be regarded as being obviously affected with the soft rot, if, at the time of inspection, it is squashy and/or the surface is at some part distinctly broken or wet owing to disease.

† When the potatoes have been passed over a riddle of greater mesh than 1½ in., the minimum size may, at the seller's discretion, be appended to the grade name—e.g., E. & W. No. 1 Size (2 in.)

‡ As measured clear within the bounds of the mesh.

APPENDIX XXIII.  
Market charges in important markets in India.  
(Per maund.)

Name of the market.	Commission.		Brokerage.		Haulage.		Charity.		Handling.		Oetrol.		Miscellaneous.		Total payable by		Total.	Remarks.		
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	Seller.	Buyer.				
	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.	A. P.			
Haldwani	3	0	...	...	0	2½	0	1½	0	3	0	4	...	...	3	4½	1	7½	5	Rangoon potatoes.
Patna	1	6	...	...	...	...	...	...	...	...	...	...	...	...	2	4	1	0	5	Madras potatoes.
Calcutta	1	0	...	...	1	4½	0	4	...	...	...	...	...	...	1	8½	...	...	2	U. P. potatoes.
Calcutta	2	6	...	...	1	4½	0	5	...	...	...	...	...	...	1	8½	...	...	4	Bihar potatoes.
Calcutta	2	6	...	...	1	4½	0	5	...	...	...	...	...	...	4	8½	...	...	4	Local potatoes.
Bombay	3	6	...	...	1	6	...	...	...	...	...	...	...	...	2	6	...	...	6	
Poona	...	0	...	...	...	...	...	...	...	...	...	...	...	...	...	7½	1	7	1	
Ahmedabad	3	0	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	3	
Surat	2	6	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	7	
Kolhapur	1	3	...	...	...	...	...	...	...	...	...	...	...	...	...	7	...	...	5	
Hubli	0	9	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...	...	3	
Madras	3	6	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...	...	7	
Mettpalalyam	3	6	...	...	0	9	...	...	...	...	...	...	...	...	...	10½	...	...	5	
Lahore	0	5½	...	...	...	...	...	...	...	...	...	...	...	...	...	10½	...	...	4	
Amritsar	1	6	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	11	
Ludhiana	0	11½	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	8	
Karnal	0	11½	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	10	
Simla	0	5½	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	2	
Lahore	1	8½	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	3	
Laknau	0	10½	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	3	
Multan	2	0	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	6	
Ludhiana	0	11½	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	3	
Simla	0	5½	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	3	
Rawalpindi	0	5½	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	3	
Nagpur	1	3	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	5	
Karachi	1	4	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	1	
Hyderabad	2	0	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	6	
Sukkar	1	0	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	4	
Shikarpur	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	6	
Cuttack	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	3	
Bangalore	2	0	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	1	
Patnala	0	6	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	3	
Baroda	1	0	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	5	
Secunderabad	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9½	...	...	8	

Commission is 4 annas per md. when the produce sells up to Rs. 4 per md. and 8 annas when it sells at more than Rs. 4 per md.

Locally produced potatoes.

Imported potatoes.

Exported potatoes.

1 = Payable by seller.

2 = Payable by buyer.

1=Payable by seller.

2=Payable by buyer.

Commission is 4 annas per md. when the produce sells up to Rs. 4 per md. and 8 annas when it sells at more than Rs. 4 per md.



# APPENDIX XXIV.

## *Specimen form of a bill of sale used in Manchur (Bombay Presidency).*

<p><b>BILL OF SALE.</b></p>		<p><b>BILL OF SALE.</b></p>	
Receipt No.	Telegraphic address	Receipt No.	Telegraphic address
Day.....	Dated.....19 .	Day.....	Dated.....19 .
Mr.....	Residence.....	Mr.....	Residence.....
<p>On Govt. List.</p>		<p>On Govt. List.</p>	
<p>Messrs. ....</p>		<p>Messrs. ....</p>	
<p>General Merchants &amp; Commission Agents, Akbar Market, <i>Manchar</i>.</p>		<p>General Merchants &amp; Commission Agents, Akbar Market, <i>Manchar</i>.</p>	
<p>" You are kind enough to sell 3 bags of potatoes lot No. 17. The account of the same is given below :</p>		<p>You are kind enough to sell 3 bags of potatoes lot No. 17. The account of the same is given below :</p>	
Deposit Rs.....	Name.....	Deposit Rs.....	Name.....
Potato bags	Bengal Md.	Potato bags	Bengal Md.
.....	.....	.....	.....
Fixed pala	per rupee	Fixed pala	per rupee
.....	.....	.....	.....
Potato bags	Bengal Md.	Potato bags	Bengal Md.
.....	.....	.....	.....
<p>Total .</p>		<p>Total .</p>	
<p>Please examine the account as written above.</p>		<p>Please examine the account as written above.</p>	
<p>E. &amp; O. E.</p>		<p>E. &amp; O. E.</p>	
<p>Messrs.....</p>		<p>Messrs.....</p>	
<p>Sd.</p>		<p>Sd.</p>	

APPENDIX XXIV—*contd.*

## NOTE.

(Appearing on the back of the bill of sale.)

(1) Buying and selling of the goods is done daily in the mandi.

(2) Sorting of goods.—(a) Tiny bits, rotten and spotted potatoes should be set aside and the selected ones must only be sold. Thus there will be a gain.

(b) If the produce is not sorted the prices will be low.

(3) After the selling of goods, the accounts should be settled, and money should be received and signed for.

Messrs.....

General Merchants and Commission Agents,

Akbar Market, *Manchar*,

D. Poona.

*Specimen form of a bill of purchase used in Manchar (Bombay Presidency).*

Tele. Address.....

Receipt No..... Day..... Dated.....19 .

BILL OF PURCHASE.

Mr..... Residence.....

Messrs.....

General Merchants & Commission Agents,  
Akbar Market, Manchar.

You are kind enough to buy 3 bags of potatoes lot No. 17 and the account is given below :—

Deposit Rs..... Name.....Rs.

*Details of account.*

Rs. Lot No. Bags.

.....  
Commission. Hamali. Labour.  
Dharmao.

Please examine the account as written above. E. & O. E.

The goods bought have to be accepted whether good or bad.

Messrs.....

Sd.

Sd.

Tele. Address.....

Receipt No..... Day..... Dated.....19 .

BILL OF PURCHASE.

Mr..... Residence.....

Messrs.....

General Merchants & Commission Agents,  
Akbar Market, Manchar.

You are kind enough to buy 3 bags of potatoes lot No. 17 and the account is given below :—

Deposit Rs..... Name.....Rs.

*Details of account.*

Rs. Lot No. Bags.

.....  
Commission. Hamali. Labour.  
Dharmao.

Please examine the account as written above. E. & O. E.

Messrs.....

Sd.

APPENDIX XXIV (a)—*contd.*

## NOTE.

(Appearing on the back of the bill of purchase.)

1. Payment should be made on the day on which the goods are bought.
2. If the purchaser does not pay the price of the commodity within three days of purchase, the mandi shall, according to the existing rules, sell the commodity either in its own mandi or in any other mandi at the entire risk of the purchaser and will charge its commission on such a transaction.
3. An advance of Rs. 5 should be paid for the goods ordered from out-stations. The balance will be recovered through V.-P.P., a commission of annas eight being charged on each bag of potatoes.
4. If the value of the goods is paid entirely in cash, the purchaser should get the payment of purchase price endorsed on the receipt.
5. Interest at the rate of annas twelve per cent per month will be charged on the value of the goods purchased, if the amount is not paid within three days of the date of sale.

Messrs.....,

Akbar Market, *Manchar*.

# APPENDIX XXV.

*Temperature and humidity at certain important potato growing districts.*

		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1. Lucknow	Maximum . Minimum . Humidity .	73.4 46.7 81	78.4 50.7 69	91.0 60.2 51	101.8 70.7 39	105.1 77.6 46	101.5 81.5 65	92.7 79.4 82	90.4 78.5 87	91.9 76.4 81	91.2 65.6 70	83.8 53.1 72	75.7 46.3 79	89.7 65.6 69
2. Patna	Maximum . Minimum . Humidity .	72.7 50.7 78	77.6 53.8 69	90.2 63.9 52	99.8 73.4 51	100.2 77.7 64	96.3 80.0 77	90.6 79.8 86	89.2 79.5 87	89.8 78.9 84	88.5 72.5 73	81.9 60.7 71	74.3 51.8 75	87.6 68.6 72
3. Burdwan	Maximum . Minimum . Humidity .	78.6 55.0 75	83.2 58.6 71	93.4 68.1 67	100.2 75.4 72	97.8 77.5 77	93.7 79.2 83	90.2 79.3 87	80.4 79.1 88	89.8 78.8 86	89.0 74.5 81	83.6 64.2 75	78.5 56.1 73	88.9 68.1 78
4. Darjeeling	Maximum . Minimum . Humidity .	46.6 34.7 81	48.4 35.5 83	56.3 42.1 73	62.5 48.5 78	64.0 52.1 88	65.5 50.2 94	66.3 57.7 96	65.9 57.4 94	64.9 55.7 86	61.3 45.5 77	55.1 42.7 76	49.2 36.7 76	58.8 47.4 85
5. Shillong	Maximum . Minimum . Humidity .	60.6 38.5 70	62.1 41.5 68	70.2 50.7 52	73.8 56.6 61	74.4 58.8 72	74.4 63.2 83	75.7 64.3 87	75.0 63.5 87	74.9 62.0 85	71.7 54.5 79	66.7 46.3 75	62.2 39.2 70	70.1 53.3 74
6. Ootacamund	Maximum . Minimum . Humidity .	64.9 43.2 56	66.7 44.3 51	69.3 48.0 47	71.7 51.9 54	69.9 52.8 73	64.2 52.2 78	61.7 52.2 86	62.7 52.1 87	63.6 51.1 83	64.0 50.5 78	63.3 47.6 75	64.3 44.3 59	65.5 40.2 68
7. Poona	Maximum . Minimum . Humidity .	86.2 54.2 59	90.9 56.2 51	97.5 63.2 41	101.4 69.2 41	99.7 71.8 54	89.8 72.6 72	82.5 70.9 82	81.7 69.6 84	84.4 68.6 81	89.0 66.4 71	86.7 58.8 61	84.6 53.8 58	89.5 64.6 63

8. Lahore	.	.	.	68.4	72.1	83.9	96.5	105.4	1107.4	100.5	97.8	98.3	94.9	83.9	72.8	90
				41.1	45.5	54.5	64.5	73.4	80.1	80.2	78.9	73.4	60.3	48.2	40.9	61.7
				84	79	66	50	41	50	70	75	70	61	71	82	67
9. Simla	.	.	.	45.7	46.2	55.5	65.2	73.0	74.2	69.1	66.7	66.1	62.8	56.1	49.9	60.9
				35.1	35.3	43.9	51.4	58.3	60.8	60	59.2	56.6	51.1	44.9	39.3	49.7
				53	56	45	40	44	61	86	91	77	48	41	41	57
10. Sialkot	.	.	.	65.8	69.5	81.0	94.0	103.2	105.9	97.9	94.4	95.2	92.5	81.4	69.6	87.0
				43.0	45.9	55.2	65.9	75.0	80.9	79.9	78.3	74.1	62.5	50.3	42.7	62.8
				81	77	68	51	41	50	71	79	72	60	66	75	66
11. Karachi	.	.	.	76.9	79.3	86.0	90.7	93.2	94.2	91.3	88.7	89.0	92.0	88.2	80.9	87.5
				54.6	57.6	66.2	73.3	79.0	82.3	81.1	78.9	77.2	71.5	62.4	56.3	70.0
				62	68	72	75	76	76	80	82	80	70	62	58	72
12. Saugor	.	.	.	76.7	80.5	91.3	100.5	105.0	98.8	85.9	83.6	86.2	87.9	82.2	76.8	87.9
				52.1	55.2	64.7	73.1	79.1	78.4	74.1	72.9	71.5	66.1	57.8	52.5	64.4
				55	47	36	30	33	61	85	88	82	56	49	54	56
13. Quetta	.	.	.	50.9	52.9	63.7	73.9	83.4	90.6	92.8	91.2	85.7	75.3	65.8	56.6	73.6
				28.7	31.2	39.2	45.8	51.9	58.5	64.6	61.4	49.2	38.9	33.2	29.4	44.3
				82	75	63	51	44	46	55	56	47	44	55	77	58
14. Bangalore	.	.	.	80.7	86.0	91.0	93.3	91.6	84.9	82.1	81.9	81.9	81.9	79.6	78.5	84.5
				57.4	60.0	64.7	69.3	69.2	66.9	65.9	65.8	64.4	65.1	61.9	58.5	64.2
				79	71	64	71	75	80	85	85	86	82	78	79	78
15. Yamethin	.	.	.	86.0	91.5	98.1	101.3	96.6	91.1	89.6	89.4	90.7	91.0	87.1	83.8	91.3
				55.5	60.1	68.5	76.3	76.6	75.3	74.8	74.6	74.7	74.0	67.2	58.0	69.6
				80	71	62	65	75	83	85	87	88	87	85	85	79

## APPENDIX XXVI.

*A form of hundi, payable on demand (sight draft).*

*Place* .....

*Date* .....

On demand, please pay to M/S.....or order the sum of Rs.....  
against the R. R. No.....for the value.

Signature of the Managing Proprietor (Drawer).

To

M/S. ....

.....

.....

---

## APPENDIX XXVII.

*Retail prices of potatoes at the Lahore Municipal Market.*

(Per seer.)

Months.	1932-33				1933-34				1934-35				1935-36				1936-37			
	1st week	2nd week	3rd week	4th week	1st week	2nd week	3rd week	4th week	1st week	2nd week	3rd week	4th week	1st week	2nd week	3rd week	4th week	1st week	2nd week	3rd week	4th week
April . . .	A. P. 1 3	A. P. 1 3	A. P. 1 3	A. P. 1 0	A. P. 1 0	A. P. 1 0	A. P. 2 0	A. P. 2 0	A. P. 2 0	A. P. 2 0	A. P. 2 0	A. P. 2 0	A. P. 1 3	A. P. 1 3	A. P. 1 3	A. P. 1 3	A. P. 1 3	A. P. 1 3	A. P. 1 3	A. P. 1 3
May . . .	1 3	1 3	1 3	0 3	2 0	1 3	2 0	2 0	1 0	1 0	1 0	1 3	1 3	1 3	1 3	1 3	1 3	1 3	1 3	1 3
June . . .	1 3	1 3	...	1 3	1 0	1 0	1 0	1 3	1 3	1 3	1 3	1 3	...	...	1 3	1 3	1 0	1 0	1 0	1 0
July . . .	2 0	2 0	2 0	2 0	1 3	1 3	1 6	2 0	1 6	1 6	1 6	1 6	1 3	1 6	2 6	2 0	1 0	2 0	2 0	2 0
August . . .	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 9	2 6	2 6	...	2 6	2 6	2 6	2 6	2 6	2 3	2 9	2 6	2 3
September . . .	2 9	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 6	2 6	2 6	...	2 0	2 3	2 3	2 3
October . . .	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 3	2 0	2 0	2 0	2 6	2 6	2 6	...	2 0	2 3	2 3	2 3
November . . .	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 0	2 3	2 0	2 0	2 0	1 9	1 9	1 9	1 9	1 9
December . . .	2 0	2 0	2 0	2 0	1 9	2 0	2 0	2 0	2 0	2 0	...	...	2 6	1 6	1 6	2 0	1 6	1 6	1 6	1 3
January . . .	1 6	1 6	1 9	1 3	1 0	...	1 3	1 3	1 3	1 3	1 3	1 3	1 0	1 0	1 0	1 0	1 6	1 3	1 0	1 6
February . . .	1 9	1 6	1 9	1 6	1 6	1 6	1 6	1 6	1 6	1 6	1 6	1 0	1 0	1 0	1 0	1 0	1 6	1 3	1 6	1 6
March . . .	1 6	1 6	1 6	...	1 6	...	1 6	1 6	1 6	1 6	1 6	1 0	1 0	1 0	1 0	1 0	1 6	1 6	1 6	1 6



## APPENDIX XXVIII.

*Specimen form of invoice used by a firm in Simla.*

Telephono No.....

Telegraphic Address ....

Office of

Messrs.....

Bankers, Agents and Potatoes Suppliers, Simla.

Invoice No.

*Simla, dated*

Invoice for.....bags potatoes despatched from Simla to.....

On account and risk of Messrs.....

On the conditions noted on the back of this invoice.

Description and quality.	Number of bags.	Weight in each bag.	Total weight.		Rate per maund.
			Md.	Sr.	
					Rs. A. P.

Detail of expenses.

Rs. A.

Dami.....  
 Dharam chowkidara.....  
 Twine, colouring and filling bags.....  
 Cooly hiro to Station.....  
 Bilty expenses and marking.....  
 Railway freight (if paid).....  
 Chhattai.....  
 Postage.....  
 Telegrams.....

Empty

Gunny bags

@

Bank commission or V.P. charges

Transhipment of wagon at Kalka.

Total expenses.

Total.

Our commission @ Rs. 1-9-0 per cent on the total value.

Grand total Rs.

Less advance received.

Nett balance now due Rs.

Rupces in words

R/R No.

Rly. mark

Order received per

Railway receipt sent through.....

Hundi number

Colour on mouth of bags

E. & O. E.

For

Manager

*N.B.*—Every bag contains our name in full which please see before delivery

APPENDIX XXVIII—*contd.**Terms and conditions for the purchaser.*

1. After weighment of goods we will not be responsible for any sort of damage under any circumstances. The purchaser if he desires can, however, satisfy himself as to the weight and quality on the date of purchase, in Simla market.

2. We will not also be responsible for any shortage, damage and dryage in transit after the goods are despatched.

3. Payment of bill is to be made in Simla. In case there is no term or condition made with the purchaser as to the payment of bill before purchase, railway receipt will be sent through Bank or V.-P. payment of which is to be arranged by the purchaser at once.

4. When goods are not fully paid for in advance in Simla or special arrangements are not made by purchaser all railway receipts will be made in our name (self), but the purchaser will be responsible for all sorts of risk or damage in transit whatsoever.

5. Purchaser is to accept all expenses and Simla market terms and conditions.

## APPENDIX XXIX.

*A brief note on the constitution of the Co-operative Garden Produce Sale Society, Belgium.*

The objects of the Society are—

- (1) To promote production and sale of garden produce either in its raw condition or after carrying it through the necessary processes for the purpose of profitable marketing ;
- (2) To provide for and set up the necessary plants and appliances for the purpose of producing finished products out of the garden produce without the previous approval of the Registrar ;
- (3) To provide the requisite funds or credit to its members for the purpose of production ; and
- (4) To obtain and supply to its customers pure seed, manures and other agricultural requisites.

2. The maximum number of members that can be admitted to this Society is 25. Every member is required to sell all his garden produce or finished product through the Society only. Members are jointly and severally liable for all debts incurred by the Society.

3. Apart from some other items of business, it is the duty of the Managing Committee which is an elected body, to purchase pure seed, gunnies, manures and agricultural implements, examine the scales, weights, etc., and test and approve the grading of garden produce and finished products. The Managing Director of the Society is expected to keep all the things in the Society's godown and is responsible for their proper storage and safety.

4. Sales are conducted personally by the Managing Director in the presence of the owner and the former is responsible for accurate weightment and honesty in the transactions. The sales are mostly effected by a public auction but may also be carried out privately, if so desired by the owner. Garden produce or finished product, offered for auction, is graded according to quality and the graded produce is sometime pooled on the request of the producers. Gradation of perishable garden produce may be published whenever possible but of a commodity such as potatoes it is published 12 hours before the auction. Any owner having the complaints regarding the gradation of his produce communicates the same in writing to the Managing Director who withdraws it from the auction. No complaints are, however, entertained regarding gradation, weightment, prices, etc., after the auction.

Only trustworthy buyers approved by the Managing Committee are allowed to bid at the auction. The Managing Committee is not bound to accept bids if the prices offered are not reasonable. The buyer is required to deposit with the Society  $\frac{1}{4}$ th of the price of the produce immediately after the auction, otherwise the bargain is declared null and void and the Society can claim damages.

In all sales, whether by auction or private treaty, full payment is required to be made before delivery, which in the case of perishable commodities has to be taken immediately and in the case of other produce within two days of the sale.

5. Loans are granted to the members of the Society at  $1\frac{1}{2}$  pies per rupee per month for raising garden produce and for meeting other current agricultural expenses. The Committee has the power to appropriate such amounts from the sale proceeds of the produce of the borrower, as it thinks fit, for the recovery of the loan.

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## APPENDIX XXX.

*Specimen of a risk-note used when the sender elects to despatch potatoes at a special reduced or owner's risk rate.*

\* \* \* \* \*

.....Station

.....19 ..

WHEREAS the consignment of ..... tendered by me/us, as per Forwarding Order No. .... of ..... (date), for despatch by the way Receipt No. .... of ..... station, under Railway Administration to ..... (date), is charged at a special reduced rate instead of at the ordinary tariff rate chargeable for such consignment, I/Wo the undersigned do, in consideration of such lower charge, agree and undertake to hold the said Railway Administration harmless and free from all responsibility for any loss, destruction or deterioration of, or damage to, the said consignment from any cause whatever except upon proof that such loss, destruction, deterioration or damage arose from the misconduct of the Railway Administration's servants ; provided that in the following cases :—

- (a) Non-delivery of the whole of the said consignment or of the whole of one or more packages forming part of the said consignment packed in accordance with the instructions laid down in the Tariff or, where there are no such instructions, protected otherwise, than by paper or other packing readily removable by hand and fully addressed, where such non-delivery is not due to accidents to trains or to fire.
- (b) Pilferage from a package or packages forming part of the said consignment properly packed as in (a) when such pilferage is pointed out to the servants of the Railway Administration on or before delivery, the Railway Administration shall be bound to disclose to the consignor how the consignment was dealt with throughout the time it was in its possession or control and, if necessary, to give evidence thereof before the consignor is called upon to prove misconduct, but, if misconduct on the part of the Railway Administration or its servants cannot be fairly inferred from such evidence, the burden of proving such misconduct shall lie upon the consignor.

This agreement shall be deemed to be made separately with all Railway Administrations or transport agents or other persons who shall be carriers for any portion of the transit.

Witness.

Signature of sender .....

(Signature).....

Rank or

{ Father's name.....  
Caste.....Age.....

Residence.....

(Profession) .....

Witness.

(Residence) .....

(Signature).....

(Residence).....

(to be filled in by Booking Clerk)

Description of packing.....

Booking Clerk.

## APPENDIX

*Prices of some varieties of seed potatoes in Bihar (Patna)*

(Per

Date.	Bara. Size 1".			Bara Goli. Size 7/8".			Manjhola Goli. Size 6/8".		
	Phulwa.	Satha.	Lal.	Phulwa.	Satha.	Lal.	Phulwa.	Satha.	Lal.
	Rs. A.	Rs. A.	Rs. A.	Rs. A.	Rs. A.	Rs. A.	Rs. A.	Rs. A.	Rs. A.
8th September 1939 .	4 12	5 8	7 4	5 12	6 8	8 4	6 12	7 8	9 4
9th September 1939 .	4 12	5 8	7 4	5 12	6 8	8 4	6 12	7 8	9 4
10th September 1939	4 8	5 4	7 0	5 8	6 4	8 0	6 8	7 4	9 0
11th September 1939	4 12	5 8	7 0	5 12	6 8	8 0	6 12	7 8	9 0
12th September 1939	5 8	6 0	7 0	6 8	7 0	8 0	7 8	8 0	9 0
15th September 1939	5 8	6 4	7 4	6 8	7 4	8 8	7 8	8 4	10 4
17th September 1939	5 8	6 8	7 8	6 8	8 0	9 0	7 8	9 0	12 0
18th September 1939	5 8	6 8	7 8	6 8	8 0	9 0	7 8	8 8	11 0
19th September 1939	5 8	6 8	7 8	6 8	8 4	9 0	7 8	8 12	11 0
20th September 1939	5 8	6 8	7 8	6 8	8 0	9 0	7 8	8 8	11 0
21st September 1939	5 8	6 8	7 8	6 8	8 0	9 0	7 8	8 8	11 0
22nd September 1939	5 8	6 8	7 8	6 8	8 0	9 0	7 8	8 8	11 0
24th September 1939	5 8	7 0	7 8	6 8	8 0	9 0	7 8	9 0	11 0
25th September 1939	5 8	7 0	7 8	6 8	8 0	9 0	7 8	9 0	11 0
26th September 1939	5 8	7 0	7 8	6 8	8 0	9 0	7 8	9 0	11 0
27th September 1939	5 8	7 0	7 8	6 8	8 0	9 0	7 8	9 0	11 0
28th September 1939	5 8	7 0	9 0	6 8	9 0	11 0	7 8	10 0	12 0
29th September 1939	5 8	7 0	9 0	6 8	9 0	11 0	7 8	10 0	12 0
30th September 1939	5 8	7 8	...	7 0	9 0	...	7 8	10 0	...
1st October 1939 .	6 0	7 0	6 0	7 0	9 0	8 0	8 0	9 8	9 0
3rd October 1939 .	7 0	8 0	5 8	8 0	9 0	7 0	9 0	10 0	8 0
4th October 1939 .	7 0	8 0	5 8	8 0	9 0	7 0	9 0	10 0	8 0
5th October 1939 .	7 0	8 0	5 8	8 0	9 0	7 0	9 0	10 0	8 0
6th October 1939 .	7 0	8 0	5 8	8 0	9 0	7 0	9 0	10 0	8 0
8th October 1939 .	7 0	10 0	7 0	8 0	11 0	9 0	9 0	12 0	10 0
9th October 1939 .	7 0	10 0	7 0	8 0	11 0	9 0	9 0	12 0	10 0
10th October 1939 .	7 0	10 0	7 0	8 0	11 0	9 0	9 0	12 0	10 0
11th October 1939 .	7 0	9 0	8 0	9 0	11 0	10 0	11 0	13 0	12 0
12th October 1939 .	7 0	9 0	8 0	9 0	11 0	10 0	10 0	13 0	12 0
13th October 1939 .	7 0	9 0	8 0	9 0	11 0	10 0	10 0	13 0	12 0
14th October 1939 .	7 0	9 0	8 0	9 0	11 0	10 0	10 0	13 0	12 0
15th October 1939 .	7 0	9 0	8 0	9 0	11 0	10 0	10 0	13 0	12 0
Average .	6 0	7 6	7 4	7 2	8 12	8 13	8 3	9 13	10 6

XXXI.

market during the period from 8th September 1939 to 15th October 1939.

maund.)

Chhoti goli. Size 5/8"			Chharri. Size 4/8"			Average.		
Phulwa.	Satha.	Lal.	Phulwa.	Satha.	Lal.	Phulwa.	Satha.	Lal.
Rs. A.	Rs. A.	Rs. A.	Rs. A.	Rs. A.	Rs. A.	Rs. A.	Rs. A.	Rs. A.
7 12	8 8	10 4	8 4	9 8	11 4	6 10	7 8	9 4
7 12	8 8	10 4	8 4	9 8	11 4	6 10	7 8	9 4
7 8	8 4	10 0	8 0	9 4	11 0	6 6	7 4	9 0
7 12	8 8	10 0	8 0	9 8	11 0	6 10	7 8	9 0
8 0	8 8	10 0	8 8	9 0	11 0	7 3	7 11	9 0
8 0	8 8	10 0	8 8	9 0	11 0	7 3	7 13	9 14
8 0	8 12	11 4	8 8	8 8	12 0	7 3	8 0	11 0
8 8	8 8	13 0	8 0	8 0	13 8	7 3	8 4	10 8
8 0	9 0	12 0	7 0	8 8	13 0	6 14	8 4	10 10
8 0	9 4	12 4	7 0	8 8	13 4	6 14	8 4	10 10
8 0	9 0	12 0	7 4	8 4	13 0	6 15	8 1	10 8
8 0	9 0	12 0	7 4	8 4	13 0	6 15	8 1	10 8
8 0	9 0	12 0	7 4	8 4	13 0	6 15	8 1	10 8
8 0	9 0	12 0	7 4	8 4	13 0	6 15	8 10	10 8
8 0	9 8	12 0	7 4	9 12	13 0	6 15	8 10	10 8
8 0	9 8	12 0	7 4	9 12	13 0	6 15	8 10	10 8
8 0	9 8	12 0	7 4	9 12	13 0	6 15	8 10	10 8
8 0	9 8	12 0	7 4	9 12	13 0	6 15	8 10	10 8
8 0	8 8	13 0	7 12	8 12	13 8"	7 1	8 10	11 11
8 0	8 8	13 0	7 12	8 12	13 8	7 1	8 10	11 11
8 0	8 8	...	7 12	8 12	...	7 2	8 12	...
9 0	10 0	10 0	10 0	10 8	11 0	8 0	9 3	8 13
10 0	10 8	9 0	10 4	9 8	9 8	8 14	9 6	7 13
10 0	10 8	9 8	10 4	9 8	8 0	8 14	9 6	7 10
10 0	10 8	9 8	10 4	9 8	8 0	8 14	9 6	7 10
10 0	10 8	9 8	10 4	9 8	8 0	8 14	9 6	7 10
10 0	13 0	11 0	11 0	14 0	12 0	9 0	12 0	9 8
10 0	13 0	11 0	11 0	14 0	12 0	9 0	12 0	9 8
10 0	13 0	11 0	11 0	14 0	12 0	9 0	12 0	9 8
12 0	14 0	14 0	13 0	15 0	15 0	10 6	12 6	11 13
12 0	14 0	14 0	13 0	15 0	15 0	10 3	12 6	11 13
12 0	14 0	14 0	13 0	15 0	15 0	10 3	12 6	11 13
12 0	14 0	14 0	13 0	15 0	15 0	10 3	12 6	11 13
12 0	14 0	14 0	13 0	15 0	15 0	10 3	12 6	11 13
9 1	10 5	11 10	9 3	10 8	12 5	7 15	9 6	10 1

## APPENDIX XXXII.

*Potato research scheme in the Kumaon Hills, United Provinces.*

The object of this scheme is to supply seed potatoes to the plain tracts of the province, where about 150,000 acres are devoted to the cultivation of potatoes but the losses in storage are very high due to adverse climatic conditions.

Two crops of potatoes are grown in the hills, one at a higher altitude planted in March and harvested in September-October and the other in the valleys planted in February and harvested in the early part of July. As potatoes require rest for a period of about 3 months before planting, the seed of the crop raised in the valleys may conveniently be used in the plains where the season of planting generally falls in October.

In March 1938, 22,400 lb. or 272 maunds and 9 seers of *Majestic* and 56,000 lb. or 680 maunds and 22 seers of *Dunbar Cavalier* varieties of potatoes, which are considered suitable for both hills and plains, were imported from Scotland and have been distributed in the three districts of Garhwal, Almora and Nainital for planting at high altitudes of 5,000 to 7,000 ft. above the sea level. The seeds have been distributed among the growers on condition that they shall return to the Government 25 per cent or more of the quantity actually advanced for planting and shall also sell to the Government the balance of the produce at current rates, the total quantity sold being not less than three times the weight of seed potatoes advanced. When the imported seeds multiply, they will be exported for planting in the valleys. In this way, the export of potato seeds from the hills to the plains will commence from October 1940.

For the purpose of collection and distribution of seeds, the whole area has been split up into small zones. The staff appointed for the purpose consists of 1 Inspector, 1 Fieldman, and 5 Mates, one of whom is literate. The entire staff works under the control of the Deputy Director of Agriculture, Rohilkhand and Kumaon Circle.

On receiving back the potatoes from the growers, they will be stored from September-October to February-March when they will again be distributed among growers. From the 15th August 1938 ten new sub-stores have been started, five of which are in the Nainital district, four in the Almora district, and one in Garhwal. Each of these sub-stores has been placed under the charge of a *kamdar*.

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## APPENDIX XXXIII.

*\*Report on commercial varieties of potatoes received from different parts of India through the Office of the Agricultural Marketing Adviser to the Government of India.*

(For elucidation of references to sample numbers and for an analysis of the preliminary report, which are referred to in this Appendix, see Appendices VI and VII of this report.)

A preliminary report on the identification of the potato varieties represented by the common trade names was submitted earlier this year. That report was based on the crop grown at New Delhi in the winter of 1939-40 and, as most potato varieties do not flower in the plains of India, the identifications were based mainly on the foliage, and tuber characters. Subsequently the whole of the material was planted out at the Potato Breeding Sub-station at Simla during the summer season which is just over; the observations on vegetative and tuber characters were confirmed and floral characters were also taken into account. The results show that the tentative grouping and identification given in the preliminary report was substantially correct. The main points of difference or interest are :—

1. A few varieties of *Magnum Bonum* had been included under *Up-to-date*, in the preliminary report, the foliage and tuber characters of these varieties when grown in the plains being quite similar.
2. Sixteen varieties were previously classified as *Gola*. While all these varieties resemble each other closely in foliage and tuber characters and must doubtless continue to be classified as *Gola*, it was found that on the basis of the floral characters, they could be divided into three groups differing in these characters. The floral characters of each group are described in the statement which follows.
3. A few varieties have been found to be wilding forms of well-known varieties. These have been shown under the group to which they belong and a note made to the effect that they are wildings.
4. Some of the varieties, which could not be identified on the basis of the data from the Delhi-grown crop, have since been identified. A few varieties still remain unidentified and it is possible that they are not of European origin but may have been imported from America or even derived from true seed of some of the older *desi* varieties. All these varieties are relatively unimportant from the commercial point of view.
5. No difference in maturity was found between the stocks included under *Phulwa*. Thus *Satha* or *Asla* (Sample Nos. 28.I to 28.V) which are reputed to be much earlier than *Phulwa* were identical with the latter in all discernable characters.

The revised identifications are given below :—

### I. *Desi* varieties :

#### (a) *Tubers white, round*—

1. *Phulwa* type.—Sample Nos. 5 (a), 10 (b)†, 14 (a), 15 (a), 17, 24, 26.I (b), 27.I, 27.II, 27.III, 27.IV, 27.V, 28.I, 28.II, 28.III, 28.IV, 28.V, 30, 36, 55 (a)†, 57, 58, 62, 64 (a), 65, 71, 73, 81, 82, 83 (a), 85, 87 (b), 99 (b), 105 (a), 106 . . . . . Total=35.

#### 2. *Gola* type.—

- (i) *Type A*.—Flowers white, anther cone invariably enclosed in bud, pollen sterile, berries absent. Samples probably identical with it are :—  
10 (a), 29 (b), 49, 53, 54, 55 (b), 59, 53 (b) . . . . . Total=8.
- (ii) *Type B*.—Flowers light red purple, anther cone generally exposed in bud, pollen fertile, berries abundant.  
15 (b), 15 (c), 18, 29 (a), 48, 63 . . . . . Total=6

\* Based on information supplied with endorsement No. F. 8/9868, dated the 16th December, 1940, from the Director, Imperial Agricultural Research Institute, New Delhi.

† They differ in some minor characters from the type. These probably represent the wilding forms.



(iii) *Type C*.—Flowers blue purple, anther cone generally enclosed in bud, pollen sterile, berries absent.

50, 51, 52, 80, 99 (a) . . . . . Total=5

(b) *Tubers purple splashed, round*—

1. Purple splashed *Phulwa* type.—5 (b), 5 (c), 64 (b), 77 (a), 88 (d), 105 (b) . . . . . Total=6

(c) *Tubers coloured, round*—

1. *Darjeeling Red Round* type.—3 (b), 4 (b), 5 (d), 11 (a), 11 (b), 26.I (a), 26.II, 26.III, 26.IV, 26.V, 43, 72, 74 (b)\*, 77 (b), 79, 87 (a), 88 (a)\*, 104 . . . . . Total=18

(d) *Tubers coloured, oval*—

1. *Silbilati* type.—76, 78 . . . . . Total=2

## II. European varieties :

(a) *Tubers white, round*—

1. *Great Scot* type.—13, 41, 68 . . . . . Total=3

2. *Epicure* type.—38 . . . . . Total=1

3. *Arran Consul* type.—38 . . . . . Total=1

4. *Ben Cruachan* type.—12 . . . . . Total=1

5. *Italian White, Round* type.—

6 (a), 7, 19, 20, 21, 25, 47, 86, 94, 95, 96, 97†, 98, 100, 101, 102 . . . . . Total=16

(b) *Tubers white, oval*—

1. *Magnum Bonum* type.—1, 2 (a), 9, 14 (b), 15 (d), 23, 37, 56 (a), 60, 61, 70, 74 (a), 75, 84, 92, 108 (b) . . . . . Total=16

2. *Royal Kidney* type.—22† . . . . . Total=1

3. *Up-to-date*.—2 (b), 31, 35, 40, 42, 44, 56 (b), 66, 67, 91, 93, 108 (a) . . . . . Total=12

4. *Ally* type.—69 . . . . . Total=1

5. *Arran Banner* type.—34, 46 . . . . . Total=2

6. *Inverness Favourite* type.—32, 45 . . . . . Total=2

7. *Long Bean* type.—107 . . . . . Total=1

## III. Unidentified varieties :

3 (a), 4 (a), 6 (b), 8, 14 (c), 15 (e), 16, 33, 88 (b), 88 (c), 89, 90, 103 . . . . . Total=13

Out of these thirteen varieties the following are probably synonymous :—

(i) Sample Nos. 6 (b) and 8.

(ii) Sample Nos. 16 and 33.

(iii) Sample Nos. 88 (b) and 103.

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\* They differ in some minor characters from the type. These probably represent the wilding forms.

†Identification uncertain.

## GLOSSARY OF VERNACULAR TERMS.

## A.

<i>Adpawmani</i>	.	.	Interest charged from the seller by the commission agent for cash payment.
<i>Arhar</i>	.	.	Name of a plant ( <i>Gajanus indicus</i> .)
<i>Arhatiya</i>	.	.	Commission agent.

## B.

.	.	.	A village merchant who is generally the village financier as well.
as	.	.	A class of itinerant merchants who do business in the Kumaon Hills.
es	.	.	Traders.

## C.

<i>Chatta</i>	.	.	Selected.
<i>Charukidara</i>	.	.	Remuneration paid to a watch-man.
<i>Chharri</i>	.	.	Very small.
<i>Chhote</i>	.	.	Small.

## D.

<i>Dalal</i>	.	.	Broker.
<i>Dami</i>	.	.	A sort of commission charged by the commission agent.
<i>Darshani hundi</i>	.	.	A sight draft.
<i>Dharan</i>	.	.	A unit of weight equal to 5 seers.
<i>Dhari</i>	.	.	A unit of weight equal to 5 seers.
<i>Diwali</i>	.	.	A Hindu festival.
<i>Dolati</i>	.	.	A sort of market charge levied in Bengal amounting to 1 seer per maund.
<i>Dongas</i>	.	.	Country boats.
<i>Dukandar</i>	.	.	Village shop-keeper.
<i>Dusehra</i>	.	.	A Hindu festival.

## G.

<i>Gaddidar</i>	.	.	Commission agent.
<i>Gauli</i>	.	.	A sort of reward paid to a commission agent for obtaining better terms.
<i>Gon</i>	.	.	A unit of weight equal to 3 maunds.
<i>Gud</i>	.	.	Mixed.

## H.

<i>Halwais</i>	.	.	Sweet-meat sellers.
<i>Hammali</i>	.	.	Cooly charges.
<i>Hats</i>	.	.	Periodical markets.
<i>Hatudharies</i>	.	.	Money borrowed without giving any security.
<i>Hundi</i>	.	.	A bill of exchange or draft.

## J.

<i>Jhau</i>	.	.	Name of a plant ( <i>Tamarix indica</i> or <i>T. gallica</i> ).
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## K.

<i>Kachcha</i>	.	.	Literally "raw" or unfinished. The word has a wide range of meaning e.g., a <i>kachcha</i> road is an unmetalled road; <i>kachcha</i> as applied to work would mean slipshod or inefficient.
<i>Kamdar</i>	.	.	A mate for labourers.
<i>Karda</i>	.	.	An allowance for impurities or foreign matter in potatoes.
<i>Karta</i>	.	.	Same as <i>karda</i> .
<i>Katha</i>	.	.	A Central Provinces measure.
<i>Kharcha</i>	.	.	Miscellaneous expenses.
<i>Khurpa</i>	.	.	Hand-hoe.
<i>Khutgari</i>	.	.	A term used for river dues.
<i>Kochais</i>	.	.	A class of merchants.
<i>Kothas</i>	.	.	Rooms in which produce is stored. Also living rooms.
<i>Kudali</i>	.	.	Pick-axe.

## M.

<i>Machan</i>	.	.	A sort of rack.
<i>Mahajan</i>	.	.	Money lender or banker.
<i>Mammooties</i>	.	.	Hand implements.
<i>Manjhola</i>	.	.	Medium size.
<i>Miti</i>	.	.	See against <i>adpawmani</i> .
<i>Moharrir</i>	.	.	A clerk.
<i>Muddati hundi</i>	.	.	A time draft.
<i>Mukaddam</i>	.	.	Literally head man or chief in a village. In C. P. the term used as an equivalent of <i>moharrir</i> .
<i>Munshi</i>	.	.	A clerk.

## N.

<i>Nazool Department</i>	.	Department dealing with Government or State land.
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## P.

<i>Painths</i>	.	.	Periodical markets.
<i>Palla</i>	.	.	A unit of weight equal to 280 lb.
<i>Panch</i>	.	.	A society of business-men.
<i>Parilers</i>	.	.	Special gunny bags.
<i>Pucca</i>	.	.	Made of masonry.
<i>Puranas</i>	.	.	Religious books of Hindus.

## S.

<i>Sahukar</i>	.	.	Money lender or banker.
<i>Shandi</i>	.	.	Periodical markets.
<i>Swega</i>	.	.	A sort of charge for weighing levied in Burma.

## T.

<i>Taccavi</i>	.	.	Loan granted by government for agricultural purposes.
<i>Talukas</i>	.	.	Sub-divisions of districts.

## Z.

<i>Zalli</i>	.	.	A basket.
<i>Zamindar</i>	.	.	Landlord.

